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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
American Gas Light Association..... 161

EDITORIALS—
The Coming Meeting of the American Association..... 162
Obituary Note—Chas. E. Putnam..... 162
Purification in Closed Vessels, and Avoidance of Nuisance in the Manufacture of Gas, by Wm. Young..... 163
The Preservation of Railroad Ties and Timber by the Use of Antiseptics, by Jos. P. Card..... 166
Regenerative Retort Firing System for Small Gas Works, by T. Blythe..... 168
Distribution by Alternating Currents..... 169

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 170
St. Paul (Minn.) Proposes to Have a Grand Illumination—Making no Charge for Putting in Services—As to its Legality—The Proposed Sale of the Halifax (N. S.) Gas Works—Would Like to Get a Franchise—Wasted Gas—Consolidated—News from Birmingham, Conn.—Instructing the Inspectors—Incorporated—The American Gas Improvement Company—A Newsy Letter from Brother Dunbar—Sale of the Flushing (L. I.) Electric Light Franchise—Restored—A Brisk Trade in the Connelly & Co. Specialties—Another Gas Thief—The Halifax (N. S.) Gas Company Favors the Jarvis Furnace—Annual Election, Providence (R. I.) Gas Company—Public Lighting at Portland, Oregon—Topeka, Kas. Similarly Affected—Offering to Lease the Works—The Gleason Company Controls the Sale of the Gregory Burners—Something More about the Petition for the Town of Lake Gas Franchise—Another Opposition Company—Brother Cressler Keeps it Up—Going Ahead at Wichita, Kas.—Negotiating—Does it Mean a War of Rates?—New Gas Company—Electric Light at Louisville, Ky.

Western Waifs, by Diaphragm..... 173
Hints to Gas Managers..... 174
In New Quarters..... 174
The Market for Gas Securities..... 174

[OFFICIAL NOTICE.]

American Gas Light Association.

SEPTEMBER 10, 1887.

To the Members of the Association:

GENTLEMEN: The fifteenth annual meeting of the Association will be held, as already announced, on Wednesday, Thursday and Friday, October 19, 20 and 21. The Convention will be called to order on the morning of the first-mentioned day, at ten o'clock, by the President, Malcolm S. Greenough, Esq. As the local Committee of Arrangements has not completed all the details of the work committed to it, I cannot now give a complete programme of the Convention, but can lay before the members the chief features of the meeting.

As I said in my last circular, the difficulty of arranging for the accommodation of the members of a convention in New York city during the fall months increases rather than decreases year by year, so that it is now found impossible to provide for the care of all the members at a single hotel; hence the Committee, in deciding on the headquarters of the Association, endeavored to secure one which would be adjacent to other hotels, in order that the members might be near each other, as the pleasure of being under one roof would be denied them. It has, therefore, been arranged that the headquarters shall be at the Sturtevant House, and accommodations for the members will also be provided at the Coleman and Grand. The Sturtevant House is situated at the corner of Broadway and Twenty-ninth street, and is run on the American plan; both the Coleman and Grand are run on the European system, the former being at Broadway and Twenty-eighth street, the latter at Broadway and Thirty-second street. Members should secure rooms in advance, by writing direct to the hotel at which they intend stopping.

The meetings will be held at Dockstader's Hall, directly opposite the Sturtevant House.

I am not able to state where the banquet will take place, but the date has been fixed for October 20.

The members still show a disposition to hold back in the matter of papers. At present we have the following promised:

"Fuel Gas," by Emerson McMillin, of Columbus, Ohio; "Illumination *vs.* Candle Power," by Alex. C. Humphreys, of Philadelphia, Pa.; "Utilization of Residual Products," by Chas. H. Nettleton, of Birmingham, Conn.; "The Advantages of Gas Companies Engaging in the Electric Light Business," by E. J. King, of Jacksonville, Ill.; "Water Gas," by Walton Clark.

From the above list it will appear that we have only five papers promised, but we need several more to fill out our time nicely. I sincerely hope that before the time comes around for sending out another notice our list of papers will foot up ten instead of five. I wish some of the members would decide on a subject for a paper and send me the title of the same at an early date. I would also suggest that the members might be thinking of the topics suggested by the foregoing list of essays, and come prepared to make the discussions on these papers very lively.

If a member has a subject in mind which he would like to have discussed at the meeting, I would be pleased to hear from him.

One member suggests as a topic for a paper the use of coke for mak

ing steam. If any member has had special experience in this direction, and could give us the comparative cost of coke and coal when employed for this purpose, he would confer a favor on several members if he would prepare a paper on the subject.

Respectfully,

C. J. Russell Humphreys,
Secretary.

THE COMING MEETING OF THE AMERICAN ASSOCIATION

We presume it is needless, in view of the concise and forcible manner in which Secretary Humphreys has called the attention of the members to the fact, to say that but something over a month's time will have elapsed when the delegates to the Fifteenth Annual Meeting of the American Gas Light Association shall be assembled in business session. However, no harmful effect can follow from a reminder at our pen at this time that, if the fullest measure of true success is to be the portion of the assemblage, now is the time to prepare for the gathering; and it necessarily follows that such preparation, to be thorough, must be based on studious effort.

Although the Secretary quite properly hints that five papers will not overburden or overfill the hours allotted to the presentation and discussion of technical subjects, and we are completely at one with him in the hope that his next official notice will show that the spirit of progress has induced five additional contributors to enter the lists, we nevertheless must congratulate the Association upon the caliber of the men who have so far agreed to write for its delectation and instruction. Furthermore, while each and all of the gentlemen specified are well qualified to handle any division of the gas maker's craft, we must add congratulation over the aptness with which they have decided in selecting themes for elaboration. Take Mr. McMillin, for instance. The ubiquitous Columbus man has been, to our knowledge, a close student of the subject of "Fuel Gas" for years back; and, in fact, he is now engaged in a study of the best system for manufacturing and supplying fuel gas to the residents of his city. Following Mr. McMillin comes Mr. Nettleton, of Birmingham, who elects to consider that important subject, the "Utilization of Residual Products." This gentleman has made the residuals account quite an important item in the economy of the Derby Gas Light Company, and the success gained by him there ought to be duplicated at other places in the States with much more frequency than is the actual case. From Mr. Nettleton's accurate practical knowledge of the subject that he is to treat upon, we are certain that his remarks will be listened to with great interest. Next in sequence appears the name of Mr. E. J. King, of Jacksonville, the worthy son of a father whose memory is yet fragrant and green in the affections and respect of the members of our craft. Mr. King was one of the first to seriously consider the wisdom of operating the combined supply of gas and electricity. Studious, painstaking and the soundest of reasoners, but one result can follow the reception of what he will say on his chosen theme said result being the knowledge that those who listened heard the judgment of one who knew whereof he spoke. Mr. W. Clark, of New Orleans, is also thoroughly qualified to handle "Water Gas" in all its phases, since he is far from occupying a tyro's position in regard to its manufacture. Last of all we welcome the appearance of Mr. A. C. Humphreys to the list of paper writers, and venture to assert that something new and important will, by means of his contribution, be added to the literature of this vexed (although decidedly mystifying and far from determined) question—"Illumination *vs.* Candle Power."

Coming now to the suggestion thrown out by Secretary Humphreys that a valuable topic for a paper is to be found in the steam raising capacity or value of coke, we sincerely hope that the gage will be accepted. It may seem rather forward to express a preference in these columns as to whom we would be especially glad to hear from in respect of the mooted question, but no harm can ensue to the Association did we hint that either Mr. Thos. Curley, of Wilmington, Del., or Mr. Jas Somerville, of Indianapolis, Ind., would fill the bill completely. A better proposition than the last would seem to be set forth were we to expunge "either," substituting "both" therefor.

It is quite on the cards for all the visitors to know that New York is at its best in the nut-brown month of October, the only drawback (if it can be so called) being, despite the multiplicity and hugeness of our city's hotels, the difficulty of housing at comparatively short notice all heads beneath one roof. The tact and generalship of that division of the local Committee of Arrangements, however, has been most happily shown. The Sturtevant, Coleman and Grand Hotels are within easy hailing distances, are well kept and appointed hostelries, and are in the very heart of the city, with the certainty that any desired point can be easily and comfortably reached, and by almost any sort of transportation method wished. To crown all, Dockstader's Hall cannot fail to prove a most desirable place for assembling in business session, all of which goes to prove that in respect to accommodation the members are amply secured. In the meantime, remember the hints of your wide-awake Secretary, who will make no complaint should you, within a fortnight, compel him to double up the list of papers promised for the coming October gathering.

OBITUARY NOTE.—CHARLES E. PUTNAM.

By E. G.

In the issue of the Journal, dated August 16, you make brief mention of the death of Mr. Chas. E. Putnam, of Davenport, Iowa. Not only was Mr. Putnam an able and upright member of the Iowa bar, but his well-known interest in all that pertains to the welfare of the community led him, at an early period, to devote a large share of his time to the development of the business of the Davenport Gas Light Company, of which corporation he was President at the time of his death.

No other event of late years has more greatly stirred that beautiful Western city than the passing away of this splendid type of a perfect citizen, for all denominations of religion, and all classes of men, united in testifying to his worth, and in bearing witness to the loss which they have sustained through his demise.

The burial service was held at Davenport, on July 22, and was attended by numerous friends, numbers of whom traveled many miles in order that they might be present at the obsequies over their loved dead. The Rev. Mr. Williston, who conducted the services, spoke feelingly in his address of the worth and character of our departed friend. In referring to the personality of the deceased, the speaker said:

"His always seemed to me a knightly soul. Dishonor could wound no nature more keenly than his. I have found myself since he died involuntarily repeating to myself the old Platonic formula for a finished humanity—'the true, the good, the beautiful'—and so my heart would chant it again now, its votive strain to the memory of the friend who will return no more. I know how his lip would have curled if ever a bad thing was done in his sight. I am sure he never stooped and did another a wrong. The mean cases did not seek his defense. Rascality passed the firm of Putnam & Rogers by. Here were two upright men. For a quarter of a century they held their names above reproach—champions of the sacredness of law, and brave enough to keep their practice clean."

Mr. Putnam was born at Saratoga, and sprang from one of the oldest and most honored families of that place. Like many others of his day and time, the West presented an attraction and charm for his vigorous intellect and indomitable energy, and having removed thereto we note, during the first year of his residence in that great section of the country, he became united in marriage to Mary Louise Duncan, the accomplished daughter of Joseph Duncan, Governor of the State of Illinois—one of the men who contributed largely to the welfare and progress of that State in its developmental days. Their marriage created almost an ideal union—the energy, cheerfulness and talents of the wife, appreciated and recognized by the husband, filled up the measure of his broad and useful life.

A friend, bearing testimony to the many-sided culture and talent of the deceased, remarks:

"One of the characteristics of Charles E. Putnam was the unflagging interest he maintained in literature, science and art. Pressed by the demands of an extensive business, and with the cares of a large family, his mind never succumbed to these necessities, but he was ever master of circumstances. With calmness, wisdom and energy, he gave minute and careful attention to every detail of business, to every desire of his growing family, but there remained the reserved force and sentiment of an elevated character. He found time for the advancement of those general interests in education, science and art which belong to a large community, and also for individual study and enjoyment in this direction. His friends, while sincerely lamenting their loss, can derive consolation in remembering that his beautiful

"Soul, of origin divine,
God's glorious image freed from clay,
In heaven's eternal sphere shall shine,
A star of day!

The sun is but a spark of fire,
A transient meteor in the sky;
The soul, immortal as its sire,
Shall never die."

Purification in Closed Vessels, and Avoidance of Nuisance in the Manufacture of Gas.

[The following interesting paper was read by the author (Mr. William Young) at the last meeting of the North British Association of Gas Managers.]

The subject of this paper is so wide in its range—embracing as it does all the stages of gas manufacture, from the liming of coal in the retorts, and the treatment of gas during condensation and scrubbing, to the final stages for the elimination of the bisulphide of carbon—that it would be impossible to enter into minute details in the limited time at our disposal. I therefore purpose confining my remarks to the broad principles involved, more particularly in the removal of carbonic acid, sulphuretted hydrogen, bisulphide of carbon, and the sulpho-hydrocarbon compounds, by the ammonia and pure hydrocarbons derived from the coal itself. Before entering, however, upon the main subject, I may be permitted to make some allusion to matters that have suggested themselves to mind as having an intimate bearing upon the avoidance of nuisance during the manufacture of gas.

You are all aware that the quantity and nature of the impurities which are to be removed at the purification stage proper are principally dependent upon the constitution of the crude material used in the production of the gas. Were it possible to obtain a supply of a pure hydrocarbonaceous substance—such as refined petroleum or mineral oil—there would be no impurities. But in coal we have the hydrocarbonaceous portion combined with oxygen, nitrogen, and sulphur—all of which lead by combination to the formation of impurities which have to be removed from the gas before it is fit for consumption. The sulphur is undoubtedly the most objectionable of these substances, as the compounds resulting from its combustion tend to the formation of acid products which are very injurious and destructive. It depends very much, however, upon the manner in which the sulphur is present in the coal, what is the nature of the combinations of sulphur produced during destructive distillation, and the comparative ease or difficulty of removing them from the gas. Broadly, the sulphur may be present in the coal in two forms of combination. It may be associated with the organic portion of the coal, or it may be combined with the mineral substances such as go to form the ash, lime, iron, etc. When in the former state of combination it may be evolved as sulphuretted hydrogen, which is easily removed by any of the well-known processes. But it is also frequently given off in combination with hydrogen, carbon, and possibly nitrogen, in a form sufficiently volatile not to be removed during condensation, or by any process at present in use. This, therefore, is the sulphur which unavoidably accompanies the gas, and leads to its banishment from all places where the acid sulphur compounds resulting from its combustion have proved injurious. When the sulphur is in combination with the mineral matter, it is more or less fixed and retained in combination, dependent upon the substance with which it is combined. If with lime or the alkalies, it remains in combination; but if associated with iron, as pyrites, it is more or less set free. And I have no doubt that it is from this source that the compound bisulphide of carbon is principally derived, which gives us so much trouble to remove.

You are aware that sulphide of carbon is decomposed when heated, commingled with hydrogen or water vapor, at a temperature far short of a gas-making temperature. You are also aware that the sulphur is not liberated from its combination with the iron by heat below that which is destructive of bisulphide of carbon in the presence of water vapor or hydrogen. Taking these facts into consideration, it is reasonable to infer that the sulphide of carbon is principally formed during the latter stages of the destructive distillation of the coal, when there is a great mass of incandescent carbon, and the temperature is sufficiently high to liberate part of the sulphur from the pyrites. The sulphur coming in contact with this incandescent carbon when there is a comparative absence of water vapor or hydrogen to form sulphuretted hydrogen, unites with the carbon, and forms carbon bisulphide. Should this inference prove correct (and some crude experiments which I have made lead me to believe that it is), then it follows that if water vapor or hydrogen were admitted into the retort, so as to commingle with the gas at a temperature high enough to decompose the bisulphide of carbon, we could get rid of this compound by having the sulphur converted in the easily removable sulphuretted hydrogen. If steam were employed this could be effected, if it were not introduced so far in as to lead to its decomposition by the fixed carbon, and to the production of carbonic acid. Indeed, it is questionable if it would be necessary to introduce the steam into the retort at all, as, from the recent investigations of Mr. W. Foulis on the temperature of the gas in the stand-pipe, it would appear that it would only be required to introduce the steam into the stand-pipe.

I have no doubt that the comparative freedom of the gas from bisulphide of carbon, when the coal is mixed with lime, is principally due to the liberation of the water of hydration of the lime during the later stages of the distillation, when any sulphur which is given off from the mineral matter in the coal is formed into sulphuretted hydrogen. The sulphur left in combination with the mineral matter after carbonization is also liable to create a nuisance; for when sulphide of lime is brought into contact with water and carbonic acid at comparatively low temperatures, the sulphur is liberated as sulphuretted hydrogen. The sulphur left in combination with the iron is rapidly given off as sulphurous acid when the coke is exposed to the air, and when being quenched, as sulphuretted hydrogen. During the time that the coke is wheeled out into the open air, and during quenching with water, I have good reasons for believing more sulphur is liberated into the air than accompanies the gas from the same coal as at present purified. The sudden quenching of the coke also tends to its disintegration, and the production of breeze or small coke; and there is also a quantity of ammonia liberated which is lost.

It has occurred to me that this nuisance could be avoided without loss, if not with profit, by cooling our coke in close vessels. Of course, in this as in other remarks on purification in close vessels, I refer to the larger-sized works. I should propose that the coke, as it comes from the retorts, should be run directly, by an endless chain arrangement in hutches, to the top of a cooling chamber, in much the same way as the spent shale in oil works is at present taken to the top of the *debris* heap. The cooling chamber in its construction would resemble a close-topped blast furnace or lime kiln. The upper part of the chamber would consist of an annular steam producer; the lower being a structure composed of a shell of sheet iron lined with firebrick The coke would be tipped into the top of the cooling arrangement through a hopper and valve, and coming into contact with the sides of the steam producer, rapid evaporation would take place. The steam thus generated would be taken down to the bottom of the cooling chamber, and ascending through the coke, the latter would be cooled, while the former would become gradually heated, until, passing through the last introduced coke, it would be partially decomposed, setting free sulphuretted hydrogen and ammonia, which would be drawn off by a pipe, and the ammonia and sulphur recovered by any of the well-known processes. The coke, thus rendered free from sulphur, and less disintegrated by the slow cooling, would be more valuable as a fuel, and could be drawn off at the bottom by a suitable opening, at a rate proportional to that at which it was introduced at the top.

Having made these preliminary suggestions, I will now pass on to the main subject of this paper—viz., the principles involved in the purification of coal gas from carbonic acid, sulphuretted hydrogen, bisulphide of carbon, and other sulphur compounds, by means of the ammonia and hydrocarbons produced from the coal employed in the manufacture of the gas. My reasons for discussing the principles rather than their application are because they have not as yet been practically tested on a large scale, and because a knowledge of the theory (which I believe is not so general as might be desired) will enable those interested in the subject to more easily understand the various processes that have been patented for purification in close vessels, and put them in a position to judge of their respective merits. I trust this excuse will be considered sufficient by those present who are already familiar with the chemistry and principles upon which these processes depend.

Purification of gas by ammonia resembles that by lime, with this important difference—that the one purifying agent is a solution of an alkaline gas, which can be handled by pumps through pipes, and applied in closed vessels; whereas the other is a solid, entailing the periodical opening of the vessels wherein it is used, causing a nuisance which is entirely avoided in the case of liquid purification. In many respects, however, the processes are closely analogous; and as purification by lime is well understood, a comparison of the two systems may perhaps be the best means of conveying to the mind a clear conception of purification by an alkaline solution. Were I to take a piece of limestone, or carbonate of lime, and heat it to bright redness, the carbonic acid would be dissociated or wrenched from the lime or oxide of calcium, and, being gaseous, would leave the solid lime behind. On allowing the lime to cool, and adding water, it would be converted into calcium hydrate, in which state it is strongly alkaline, and on being placed in the purifiers absorbs the acid gases, carbonic acid and sulphuretted hydrogen, and becomes carbonate and sulphydrate of lime. But as the affinity between lime and carbonic acid is stronger than that between lime and sulphuretted hydrogen, by the continuous passage of a gas containing carbonic acid, the lime may be wholly converted into carbonate in the first purifiers, and the sulphuretted hydrogen driven forward to the last. The sulphydrate of calcium

so formed combines with the bisulphide of carbon so as to form the sulpho-carbonate of calcium. The carbonated lime, on being removed from the purifiers, may be reburnt and converted into calcium oxide, to be again applied as a purifying agent. When spent lime is to be reburnt in this manner it is necessary that any sulphuretted hydrogen present should be replaced by carbonic acid, as the affinity between lime and sulphur is so great at high temperatures that a sulphide is formed which, by exposure to the atmosphere, becomes oxidized into sulphate, having no purifying effect, and remaining only as so much inert matter, entailing a large and useless expenditure of heat. The importance of this fact was recently illustrated in a case in which the writer was consulted, when analysis showed that the so-called revivified lime contained less than 20 per cent. of calcium oxide; the remainder being sulphate and silica and other foreign matter. While I go on to examine the action of ammonia when used for gas purification, I wish these facts to be kept in mind, as they have some resemblance to the waste of energy that may attend the revivifying of ammoniacal solution.

I have here a piece of carbonate of ammonia. If I attempt to dissociate the carbonic acid therefrom by heating it, you will observe that it disappears into the air. Both the alkaline ammonia and the carbonic acid, being gaseous at the temperature of dissociation, pass away together in the form of gas. I will drop this piece of carbonate into a test tube, and then heat it. It is dissociated—the mixed gases, carbonic acid and ammonia, passing away till the lower temperature in the upper part of the tube allows them to recombine, and to be again deposited as carbonate on the sides. It is evident, therefore, that we cannot reburn or revivify solid carbonate of ammonia, as in the case of lime, when the alkaline substance is a refractory solid. We further see that the temperature at which carbonic acid is dissociated from ammonia is far lower than in the case of lime. Indeed this temperature is considerably under the boiling point of water.

I have here another test-tube containing a little water, which I bring to the boiling point, and into this water (which I withdraw from the flame and allow to fall below 212° F.) I drop this piece of carbonate of ammonia. You will observe how violently dissociation takes place. This proves the dissociating temperature of carbonate of ammonia to be under 212° F.; but it also proves something else. There is now no deposit of carbonate of ammonia in the upper part of the tube, as was the case when the dry carbonate was dissociated. You will observe that when I thrust a lighted match into the tube it is at once extinguished; showing the presence of some heavy gas which is not a supporter of combustion. You will also observe that on adding this acid solution of litmus to the water it is immediately changed blue; showing that the water holds an alkali in solution. How has the presence of the water so modified the results? You are all aware of the great affinity or solvent power of water for ammonia. We employ this affinity to free our gas from ammonia. You are also aware that water dissolves carbonic acid gas; but its solvent power is very small—only about 1-600th that which it has for ammonia.

Now, when I dropped the piece of carbonate of ammonia into the water slightly below the boiling point, dissociation at once commenced; the chemical affinity between the ammonia and the carbonic acid being completely overcome by the heat. The relative solubility of the ammonia led to its almost complete absorption by the water, whilst the comparatively insoluble carbonic acid escaped as a gas, accompanied by a small quantity of ammonia. Sulphuretted hydrogen is, if anything still more easily dissociated from the ammonia than carbonic acid; and therefore, in this respect, ammonia possesses advantages over lime. If, then, I were to keep up the temperature of the water in the tube, and drop a further quantity of carbonate of ammonia in, the water would by and by become saturated, and both the ammonia and the carbonic acid would be evolved together; and were the temperature reduced to less than about 180° F., dissociation would cease. These facts limit the strength of the solution of ammonia salts which can be dissociated, under ordinary conditions, to those containing 2½ per cent. or 1-40th of their weight of ammonia—that is, for every ton of caustic ammonia produced, there would have to be heated to the temperature of dissociation about 40 tons of water, entailing the employment of very large dissociating plant; and the bringing of such large quantities of weak solutions of ammonia into contact with the gas would also necessitate very extensive purifying plant, and in this respect would incur a cost similar to that of reburning and purifying with lime containing 80 per cent. of foreign matter, to which I have already referred.

Accordingly many attempts have been made from time to time to obviate this difficulty. In 1870 Mr. F. C. Hills devised a plan by which comparatively weak solutions were concentrated by distillation; and in 1881 the writer, and shortly after Mr. Claus, patented processes by which the ammonia is separated from the weak solutions in the anhydrous or gaseous state, and directly mixed with the gas to be purified. These processes had undoubted advantages; but they had also counterbalancing disadvantages. The quantity of fuel required to distil the ammonia from the weak causticized solution was very great, and the commingling of the ammonia gas with the coal gas direct led to troublesome deposits of carbonate of ammonia in the vessels in which they were brought into contact. Some difficulty was also experienced in regulating the quantity of ammonia gas to that necessary to effect purification; while the reabstraction of the ammonia had the disadvantage already mentioned of requiring large plant. All these facts pointed to the desirableness both of using and revivifying the ammonia in solution and in a concentrated condition. It has been seen, from the experiment, that the ammonia can be revivified or dissociated from the carbonate in a weak solution, owing to its solubility in water. It is therefore evident that if we were in a position to increase this solubility at the temperature of dissociation, a condition of things would be induced which would enable us to effect the object desired. I have pointed out the difficulties which beset our path in the process of purification by ammonia, and I have endeavored to explain the principles by which we have thus far been guided. I will now direct your attention to a physical law which has been taken advantage of only in the process lately devised by myself.

The quantity of gas taken up or held in solution by a liquid is in direct proportion to the pressure, and in inverse proportion to the temperature; and thus the boiling of water depends upon the vapor tension, which is increased in direct ratio to the pressure. On the other hand, chemical affinity is not subject to the same law; and although, in some cases, the temperature at which chemical changes take place is considerably modified by pressure, it does not materially interfere with the dissociation of ammonia from the salts formed by its union with carbonic acid and sulphuretted hydrogen. Bearing these facts in mind, it will readily occur to you that if, instead of dissociating the gases from the solution of ammonia salts under atmospheric pressure, we did so in strong vessels under a much higher pressure, we could employ a stronger solution with little or no loss of ammonia, and the separation of the gases could be conducted more rapidly from the higher temperature which could with safety be employed. I am sorry that the experiments, which have led to this conviction in my mind, are of such a nature that I cannot avail myself of the pleasure of performing them in your presence. I may, however, explain that they were made with solutions of carbonate and sulphide of ammonia, about three times the strength of ordinary gas liquor, in a strong malleable iron still under different pressures; and that the ammonia passing along with the gases was carefully estimated, as well as the quantity held in solution, together with the carbonic acid and sulphuretted hydrogen. The results were such as were anticipated. As the pressure under which dissociation was effected was increased, the quantity of ammonia gas passing away with the acid gases was diminished, whilst the quantity held in solution in a caustic state in the still increased with the pressure.

Having considered the physico-chemical principles in virtue of which ammonia may be separated from its salts in strong solutions, let us now examine the arrangement of such mechanical apparatus as may be necessary effectively and economically to secure the end in view. In order to revivify the ammonia by its separation from the carbonic acid and sulphuretted hydrogen with which it has become combined in purifying the gas, it must be forced into a strong vessel and raised to a temperature above that at which dissociation takes place to render it caustic; and before it can be again used as an absorbent of impurities it must be cooled to ordinary temperature. This heating and cooling can, in a measure, be done by what is known as regeneration, or, in other words, transferring the heat of the caustic solution flowing out of the vessel in which decomposition is effected to the cold solution of carbonates and sulphides flowing in. As, however, the solution of these salts has to absorb the small quantity of ammonia which accompanies the acid gases as they are set free, it is evident that the interchange of heat should take place after the inflowing solution has been employed for that purpose.

I now come to the mode in which the ammonia should be applied for the purification of the gas. When lime is employed, the gas is made to enter the purifier which contains the nearly exhausted or saturated lime, and the gas leaves the purifier which has been last charged; and so, when water is used to absorb ammonia, the pure water is brought in contact with the pure (or nearly pure) gas, and is drawn off where the gas enters, and after it has become nearly saturated with the ammonia from the crude gas. This system is quite suitable in cases where the purifying agent is a solid, such as lime, or a fluid difficult to volatilize, such as water; but it is inapplicable to a highly volatile substance such as ammonia.

I have here a Woulfe's bottle containing a solution of caustic ammonia, such as would be employed in purifying the gas. Through this I will pass the gas supplied to this room. You will observe that, on allowing the gas to blow against this turmeric paper, it is at once turned brown, indicating that some of the ammonia has been taken up in diffusion. To show you that the quantity is considerable, I will displace the air in this flask by the gas, and by stopping the neck with a cork having a kneed tube inserted in it, I convert the flask into a modified Cooper tube. I will now fill the knee of the tube with water, and bring it in contact with the ammonia by shaking it. On plunging it into water and removing my finger, the water rises in the neck of the flask, showing the quantity of ammonia that has been absorbed. Now I have here another Woulfe's bottle with a solution containing exactly the same percentage of ammonia as the other bottle, though in this case it is not caustic, but is combined with carbonic acid and sulphuretted hydrogen—in fact, just such a liquor as would result from the saturation of the caustic ammonia in the first bottle with these gases. In performing with this bottle the same experiment as with the other, you will see that the turmeric paper is not so rapidly affected, and the water does not rise into the neck of the flask—showing, indeed, that only an extremely small portion of ammonia is diffused through the gas. I will now pass the gas first through the caustic solution of ammonia, and then through the solution containing the salts of ammonia, and collect the gas in a flask as before. On absorbing the ammonia with pure water, you will see how very slightly the volume is reduced. These experiments show that, in solutions containing equal quantities of ammonia, it is more volatile, and more readily diffused through the gas, when in the caustic state than in a state of combination; and not only so, but that the solution containing the carbonates and sulphides has the power of absorbing a considerable quantity of caustic ammonia from the gas, and holding it in solution.

Now, in employing ammonia as a purifying agent, it is desirable to retain the solution in as concentrated a form as possible. But it is evident, from what we have just seen, that if the revivified solution were first brought in contact with the nearly pure gas, a large amount of the caustic ammonia would be diffused through the gas and carried forward, and the purer the gas the larger would be this amount. The solution would thus be rendered weaker, and the gas so contaminated would require washing or scrubbing to recover the ammonia. If, however, we reverse the order in which the ammoniacal solution and the gas are brought into contact—that is, bring the impure gas and the revivified solution of caustic ammonia first into contact, and cause them to flow, not against each other, but in the same direction—then a large quantity of the impurities would at once enter into combination with the ammonia, and form compounds which are comparatively fixed; and as solutions of these can absorb caustic ammonia gas, any ammonia volatilized from the solution into the gas will be reabsorbed by the solution of salts of ammonia as they come in contact by flowing together. Consequently the gas will pass from the purifying vessel with comparatively little ammonia in diffusion. The solution of ammonia will be retained proportionably stronger, and the gas will require less treatment and smaller vessels for freeing it from the diminished quantity of ammonia in diffusion. There are other advantages attending this method of using the ammoniacal solution. The chemical affinity between carbonic acid and ammonia is greater than that between ammonia and sulphuretted hydrogen, and, therefore, by allowing the solution of ammonia and the gas to travel together, the carbonic acid will, to a large extent, be first absorbed; and more particularly will this be the case in strong solutions of ammonia, due to the fact that in weak solutions the superior chemical affinity of the carbonic acid is partly counteracted by the greater solubility of sulphuretted hydrogen in water. The carbonic acid being first removed will allow the formation of sulphydrate of ammonia at the final stages of purification; and, as you are aware, this compound of ammonia has the power of combining with and removing bisulphide of carbon from the gas.

There are many other minor matters relating to purification by ammonia—such as the recovery of the cyanogen compounds and sulphur, and the simultaneous production of salts of ammonia—that deserve attention. To deal with these, however, would require more time than can now be given thereto.

Having now taken into consideration the main principles involved in the application of ammonia to the purification of gas, it might be well, before leaving the subject, briefly to recapitulate the various salient points. We have thus seen: That the ammonia, being gaseous at ordinary temperatures, cannot, as in the case of the solid alkaline substance lime, be dissociated and separated by heat from its combination with acid gases. That the separation of the alkaline ammonia from the acid gas can only be effected by the introduction of the solvent affinity of water. That under atmospheric pressure the solvent affinity of water at the temperature at which dissociation takes place is only capable of holding in solution from 2 to 2½ per cent. of ammonia gas. That the employment of such weak solutions would involve the use of very large plant, both for the dissociation of the acid gases from the ammonia and also in the application of ammoniacal solution to the acid gases and other impurities in the coal gas; that it would entail a larger fuel expenditure; and that, in endeavoring to increase the chemical action between the impurities in the gas and the ammonia by concentrating the weak solution, or rendering the ammonia gaseous by distillation, the cost for fuel would be increased, as also the dimensions of the dissociating and distilling vessels. That by effecting dissociation under pressure, stronger solutions can be revivified without loss of ammonia, owing to the fact that the ammonia is much more solvent in water under increased pressure. That by employing the solution of salts of ammonia, formed by the union of the impurities and the caustic ammonia, to absorb and hold in solution the surplus caustic ammonia, the strength of the solutions is not materially reduced in their application to the purification of the gas. Also that the employment of such stronger solutions enables the work to be done with smaller and simpler apparatus, and with the expenditure of less fuel. The mechanical arrangements for carrying these principles of purification into effect have already appeared in the pages of journals devoted to the industry, and to these I beg to refer you.

It now only remains for me to make a few remarks upon the purification of coal gas from the more complex and difficultly-removable sulphur compounds of carbon, hydrogen, and probably nitrogen. I have already had the pleasure of making three communications to this Association on the subject. The first was in 1876, in a paper upon the utilization of waste shale gases and the recovery from these gases of the liquid hydrocarbons diffused in them, when I drew attention to the affinity of these hydrocarbon fluids for sulphur compounds. Again, in 1879, I went more fully into the subject, describing particularly the physical conditions necessary to the successful abstraction of the sulphur compounds from coal gas. In the succeeding year I again referred to the subject, and gave practical illustrations of the method by which the hydrocarbon fluid should be applied to the gas to remove these compounds. Since communicating these papers millions of gallons of volatile hydrocarbon fluids have been recovered from the waste shale gases. So far as I am aware, however, no attempt has been made on a practical scale to apply them to the purposes described in these communications. I have no doubt, however that they, or kindred hydrocarbons from our tar, will in future play an important part in gas purification, more particularly in conjunction with liquid purification by ammonia. For details relating to the subject I must refer you to these papers, as time will not permit us to more fully investigate it. As, however, in experimenting upon purification by ammonia I had occasion to return to this matter, I may be permitted to make a few remarks more especially bearing upon the use of ordinary coal tar naphtha, or the first of the distillate of tar, for this purpose.

Ordinary coal tar naphtha, as you are aware, consists of a series of hydrocarbons having different boiling points, and identical in constitution with the hydrocarbons which are found diffused through coal gas, and which confer upon it much of its illuminating power. The presence of these hydrocarbons in the tar is partly due to the approach to saturation of the gas with them, but also in part to the solvent affinity of the heavier oils, with which they are associated during condensation, robbing them from the gas. If the isolated naphtha were presented to the gas, the gas would take up the hydrocarbons present in such proportions as would lead to approximate saturation; but if a quantity of heavy oil from the tar were added to the naphtha, equivalent in solvent affinity to the original tar with which it was condensed, then there would be a balance, and there would be neither absorption nor volatilization. Now, suppose if, instead of presenting the whole of the naphtha to the gas, we were to remove the benzol portion, and then bring the denuded naphtha and heavy oil into contact with the gas, it is evident that the solvent affinity of the naphtha, being balanced for all the other members of the hydrocarbons present in the gas, but disturbed in the benzol portion, the latter would be at once dissolved or absorbed out of the gas by the other hydrocarbons until the balance of solvent affinity was restored. Suppose, instead of the benzol part, we were to isolate and remove any other part, a similar disturbance of balance of relative solubility or diffusion would be effected, with like results. It is evident, therefore, that the character and constitution of the naphtha derived from the tar of a given coal will bear a relation to the character or constitution of the hydrocarbons diffused through the gas, and that the more perfect the process of condensation, the more certainly will this be the case—that is, if the tar is rich in benzol, so will be the gas; and, therefore, it follows that if the

naphtha is rich in volatile organic sulphur compounds, so also will be the gas. In the same manner, a coal that yields a large quantity of ammonia will produce a strong ammoniacal liquor. But just as the liquor is strong in ammonia, so will it tend to remain in diffusion in the gas, the solvent affinity of the water being balanced by the tendency of the ammonia to diffuse itself through the gas. Now, if we were to take the ammoniacal water condensed from the gas in the condensers, distil out the ammonia, and cool the denuded water, and then bring it into contact with the gas in the scrubber, we could, by its renewed solvent affinity and the fractional manner of its application, remove every trace of ammonia. If, then, by the solvent affinity of water we can remove all traces of ammonia from the gas, why should we not be able to remove the complex sulphur compounds diffused through the gas, by the solvent affinity of naphtha? The only essential condition which could possibly interfere with such a result would be that the naphtha does not possess a solvent affinity for the sulphur compounds equal to that of water for ammonia, or at least sufficiently great to make it available, and that the sulphur compounds could not be conveniently separated from the pure hydrocarbons.

The nature and constitution of the more complex sulphocarbonaceous compounds present in crude naphtha, and diffused through coal gas, are not well known. They are, no doubt, dependent upon the original form in which the sulphur is in combination in the coal from which they are derived, but also on the manner in which the coal has been carbonized. Bisulphide of carbon is undoubtedly present in considerable quantities amongst these sulphur compounds, and that they are all solvent in the associated hydrocarbons is shown by them remaining in solution, and not being precipitated by concentration. That, like bisulphide of carbon, they are not very stable compounds, is proved by some of them undergoing decomposition at comparatively low temperatures. Washing with sulphuric acid removes a very large proportion of the sulphur compounds, which might indicate that the sulphur forms part of a basic hydrocarbon containing nitrogen. This is further indicated by the fact that, when decomposed, ammonia or a volatile base is frequently evolved. Alternate washing with aqueous solution of caustic soda and sulphuric acid, and distillation, render the naphtha almost free from sulphur compounds; but the most convenient way of rendering the naphtha sufficiently pure and suitable for removing the sulphur compounds from coal gas is by simply washing with sulphuric acid, and then with an alcoholic solution of caustic soda.

I have here three Woulfe's bottles containing such purified naphtha. This fourth bottle contains bisulphide of carbon. By burning the gas supplied to this room after being brought into contact with the bisulphide of carbon, the fact that it takes up a portion in diffusion is at once made evident by allowing the products of combustion to come into contact with a disc of slightly alkaline litmus paper. You observe it is at once changed red by the sulphurous acid fumes resulting from the combustion of the bisulphide of carbon vapors diffused through the gas. You will further observe that the gas has little or no illuminating power, due to the fact that the presence of these vapors has a very injurious effect upon the illuminating power of the gas, and also because the hydrocarbon vapors in the gas, being soluble in the liquid bisulphide of carbon, are, to a great extent, removed; thus beautifully illustrating the balance that must exist between the nature of the vapor diffused through a gas and the liquids with which it comes in contact. I will now bring the gas, thus highly charged with the bisulphide of carbon vapors, into contact with the purified naphtha in the other three bottles. You will notice, on my lighting the gas, that the illuminating power is nearly restored, and that the products of combustion no longer change the color of the litmus paper; showing that the pure naphtha has dissolved out of the gas the diffused buisulphide of carbon vapors, and that a quantity of naphtha vapors have been diffused through the gas. The rapidity with which this action takes place is shown on lighting the gas after it has only once been in contact with the pure naphtha. You will observe that some considerable time elapses before the alkaline litmus paper is changed red.

The volume of bisulphide of carbon vapor which can be dissolved out of the gas by the pure naphtha is very large. I have here a glass flask which I fill with the gas saturated with bisulphide of carbon vapors; and by means of this perforated cork, I attach into the neck of the flask this tube with the knee at the lower end sealed with water, add a small quantity of purified naphtha, and bring it in contact with the gas by shaking. On removing my finger under water, you will notice how rapidly the water rushes in to take the place of the very large volume of vapor absorbed out of the gas.

It now only remains for us to consider how purified naphtha could be most effectively and most economically applied in purifying the gas from the complex sulphur compounds. The system described in the paper I had the pleasure in communicating to this Association at Perth, in 1880, is probably one of the best—that was by commingling the naphtha and ammonia sulphydrate in the one vessel, so that as the solvent affinity of the naphtha reduced the sulphur compounds diffused through the gas to the liquid form, they would thus be brought into contact with the sulphydrate of ammonia, and any of the sulphur compounds capable of entering into chemical combination with the sulphydrate of ammonia would be at once removed, leaving the naphtha in a fit condition to again absorb a further quantity. The naphtha, on becoming charged with the sulphur compounds not removable by the sulphydrate of ammonia, would be drawn off at the bottom of the purifying vessel, and subjected to the treatment to render it again pure.

From a careful consideration of the subject, and from many experiments, I feel convinced of the practicability of the entire purification of gas by means of the liquid products derived from coal; and I have every confidence that the matter only requires to be taken up by an energetic member of this or some kindred Association, who is practically engaged in the manufacture of gas, to make it an accomplished fact in the near future.

The Preservation of Railroad Ties and Timber by the Use of Antiseptics.

[A paper read by Mr. Joseph P. Card, at the last meeting of the Western Society of Engineers.]

The antiseptics that have been used up to the present time, to any considerable extent, in the preservation of railway ties and timber are: Corrosive sublimate, kyanizing; sulphate of copper, Boucherie; chloride of zinc, Burnettizing; and dead-oil, creosoting.

Many others, however, have been tried in the past or 50 more years, and abandoned for one cause and another, which I will not attempt to explain, but will confine my remarks to those now in use.

Corrosive sublimate is the most powerful poison of them all, and its antiseptic properties are some 50 or more times greater than sulphate of copper or chloride of zinc; that is, a solution of one part corrosive sublimate in 10,000 parts of water would, according to the best authorities, be more than an equivalent to sulphate of copper, diluted, one part in 400, or chloride of zinc, one part in 200 of water, which is about the minimum at which they will preserve.

In treating timber with corrosive sublimate, it is generally placed in large wooden vats for one day for each inch in thickness, not counting the day it is put in or taken out, or say 10 days for an 8 in. by 8 in. square stick.

The handling of the timber after treatment has to be done with care, or serious consequences may follow. The solution used has generally been one part in 100 of water.

The treatment with sulphate of copper has generally been done by the Boucherie process, or in copper cylinders, on account of its corrosive properties, while the treatment with chloride of zinc is done in iron cylinders, which cost, say, ten times less than copper. All three of these salts being more or less liable to be chemically changed or washed out of the wood, and as the chloride of zinc has, under most conditions, when injected in proper quantities, answered equally as well, and being cheaper and more economically handled, it has come more generally into use than either of the others. In fact, comparatively speaking, corrosive sublimate and sulphate of copper have practically gone out of use.

Chloride of zinc has served a good purpose in the preservation of railroad ties in Germany, while in England the treatment has not been satisfactory—in fact, has been abandoned. Now, why this great difference in results? The road-beds are, as I understand, alike (rock-ballasted); consequently, the drainage is the same. It must be on account of the impurities absorbed into the ties, from England's moist climate, which changes gradually the chloride into a non-antiseptic, for rainfall, as a rule, will not, so far as my observations go, wash it out. It takes more than rain; in fact, it means submerging it in water, and this would hardly occur on a rock-ballasted roadbed. If a tie were reasonably dry and in rock ballast, and it should rain, it would absorb moisture slowly as it rained; the flow would be inward, taking more or less of the salt with it, for any of the soluble salts mentioned will, to a certain extent, move around through the wood in whatever direction the moisture goes. When it rains, it goes inward or towards the center; when the moisture evaporates, to the point of evaporation. I have had this tested by analysis, to my entire satisfaction.

If ties were submerged, or partially so, in water for any considerable time, the chloride being of greater specific gravity than water, its tendency would be to go out of the ties rather than inward, or to equalize

with the water surrounding them. Again, if the ties were in sand (like the Rock Island ties, which I will mention later on), the result would be, when your sand was moist or wet, they would absorb moisture where they came in contact with it, and as it gradually moved to the point of evaporation, which would be the top or exposed portion of the tie, it would carry with it more or less of the chloride. This constant, or, at certain seasons of the year, long-continued evaporation, weakens, in my opinion, the strength of the chloride at point of contact with the ground or moisture below the minimum of its preserving properties, and in the case of the Rock Island ties, which were in clean sand, they gradually decayed where they came in contact with the ground, but remained sound on top, as a general thing.

Again, should there be impurities in the ground or water surrounding the ties, or in the rainfall, that would combine with the chloride or any salt and transform it into a non-antiseptic, as oxide of zinc, the change would be more or less rapid, and it is in this way that I account for the bad results with chloride of zinc in England; and from rainfall, if the ties are on rock ballast.

I know of Burnettized gumwood ties that were placed in cinder and slack-coal ballast in 1880 (the cinders and slack came from a coal mine dump which had been burned over) which were worthless in 12 months after being placed in the track, while ties treated at the same time, that were placed in sand, are sound to-day, or were when I examined them last year.

I do not mean to say that all cinders and slack will produce this result, but these did; neither do I wish to convey the idea that the changes mentioned heretofore occur in a day. Some of them may in a month, or, as in the case of the Rock Island ties, their average life was over 15 years.

There is a section of some 20 miles of the Union Pacific Railroad where the ties have been preserved, ever since the road was first built, by the soil in which they lie.

With reference to creosoting or the use of dead-oil in wood-preserving, if you inject a sufficient quantity of oil (of proper quality, after steaming and vacuum) into ties or timber, they will remain sound so long as the oil remains undisturbed, if it enters the wood but ½ in., or even less, on the sides of, say, a 10 in. by 10 in. stick of timber, notwithstanding the oil remains practically where it is placed at the time of treatment, and does not diffuse through the wood, like chloride of zinc, and for the following reasons:

Dead-oil contains carbolic and other acids, which are more or less soluble in water, and enough of these acids combine with the moisture in the wood at the time of treatment to destroy the fermentable or other matter then in the wood, that tends to decay, and any impurities or germs of decay thereafter coming from the outside will have to pass through the dead-oil, and in doing so are destroyed or rendered inert.

The trouble with creosoting is to get the dead-oil where you want it (it will stay where you put it), and the cost. The trouble with a mineral salt or chloride of zinc is to keep it where you put it, or where it places itself shortly after treatment, if the work on your part is properly done.

Having given you my experience, as well as ideas as to the benefits to be expected from the proper use of mineral salts and dead-oil when used by themselves, I will now submit for your consideration and discussion before this Society the process known as the "zinc-creosote" process, which consists in the use of both dead-oil and chloride of zinc in combination, for the preservation of railroad ties from decay, as well as protection against the attacks of the teredo where timber is placed in the sea.

For railroad ties, bridge-timber and the like, or where timber is subjected to no considerable moisture, as when placed on or in the ground, the process is as follows:

After preparing the timber in the usual way, by steaming and vacuum, the dead-oil is run into the cylinder, and such quantity as may be desired is forced into the wood.

For railroad ties or timber, I would recommend, say, ½ gallon to the cubic foot, or 1½ gallons to the tie. A less amount may be found to answer. After the timber has been treated with oil, the oil removed and the cylinder charged with chloride of zinc, when, by pressure, it can be made to enter the wood, pass through and beyond the oil, and impregnate by diffusion that portion of the wood that the oil will not penetrate, especially where timber is not well-seasoned or dense like oak. The aim of this process is to get the benefit of the dead-oil treatment where ties or timber come in contact with the ground or moisture, with one-half or less oil, besides having those portions of the wood not penetrated by the oil impregnated by the zinc chloride. The zinc chloride, surrounded as it is by oil, should be protected for a long time in railroad ties or bridge timber against moisture. I find that less than one-half the quantity of oil used in ordinary creosoting can be distributed by this process through every portion of the wood penetrated by the greater quantity injected in the usual way.

Creosoting, as practiced abroad, unless a much larger quantity of oil is used on railroad ties than is used in England (6 to 10 pounds to the cubic foot), is of little value, in my opinion, unless a chair is placed under the rail, to take the wear, for the following reasons:

Where dense woods are used—and, in fact, it is the case also with many of those woods which are considered porous—the heart-wood will take the oil but skin deep; consequently, the oil is in time worn off by the rail, decay begins, and at the worst possible place the spike becomes loose and the tie valueless.

This is probably the reason why there were so few American creosoted ties shown at the Exhibition of Railroad Appliances, in 1883, and the few that were there had been treated to at least 2 gallons of oil to the cubic foot. If I am not correct, I would ask what has become of the thousands that have been treated in the past 30 years in this country, where we use no chairs under the rails?

I have here one of a lot of ties treated by a Mr. Pelton some years since for the Chicago, Rock Island & Pacific Company, and put in the track near Englewood, Ill. It was taken up in May, 1883, to be shown at the Chicago Exposition of that year. These ties were treated in 1872 by what is known as the Seely process, and, although they contained but little oil (less than 4 lbs. to the cubic foot), they were sound, so far as examined by me, where they came in contact with the ground, but commenced to decay (so I was told) under the rail as soon as the oil wore off, and not before.

If a sufficient quantity of oil is used to impregnate the ties to a considerable depth at point of contact with the rail (which means for oil 50 cents, or 6 gallons to the tie, and this applies to soft woods only and not to oak), a good result would be obtained; otherwise, a chair must be used.

If you will show me one tie that has served a good purpose, I will convince you that it was treated to, at least, 6 gallons of oil, or a chair had been used. Not but what a much less quantity would preserve it from decay, if it were placed in the ground as a post, and undisturbed; but should you remove the oil at the ground line—it matters not to what extent, so that the untreated timber is exposed—you will find your creosoting of little value, and this is the experience of all.

Mr. J. W. Putnam, of New Orleans, in a letter to the Chairman of the Committee on Preservation of Timber of the American Society of Civil Engineers, says: "With reference to creosoting, wherever the coating is broken, and the air, with its dust, allowed to come in contact with the untreated wood, decay follows, and extends in each direction from the opening," and he is but one of the many who make this or similar statements.

The Burnettized ties on the Chicago, Rock Island & Pacific Railway, near Englewood—and, so far as I have examined, those on other roads, also, where the work was well done—were sound under the rail, but decayed where they came in contact with the ground. Mr. Alexander, in his report of March 23, 1882, to Mr. Hugh Riddle, then President of the Rock Island Company, says: "I have made a careful examination of the Burnettized hemlock ties we laid in the main track just west of Englewood, in November, 1866, last summer, and found at least 75 per cent. of them still in the track, and, in my opinion, in such a state of preservation that they will be serviceable for two or three years longer. Some 5 or 6 of these ties were taken out of track, and found to be sound and solid in the center, and only decayed to the depth of ⅛ to ¼ in. on the surface and sides. The rail has not worn into these hemlock ties to any greater extent than would have occurred with oak, and they hold a spike fully as well as the oak tie. The pine and cedar ties that were Burnettized at the same time have worn out in the 15 years' service and have disappeared. The tamarack have held out about the same as the hemlock." Continuing, he says: "My experience is that untreated hemlock ties decay first in the center or heart, when the spike becomes loose and the tie crumbles; but these treated ties are sound in the center, which shows that where the chloride of zinc is not washed out, the wood is in a perfect state of preservation."

I saw these ties a short time after they were taken up, and examined those remaining in the track in June, 1883 (they had then been down over 17 years), and found them to be sound under the rail, with hardly an exception. I also had the sound wood from several of these ties analyzed, and found them to contain from 0.05 to 0.14 per cent. of chloride of zinc to weight of the wood when dry.

Again, in the same report (March 23, 1882), Mr. Alexander says: "In 1872, we laid in second track, east of Washington Heights, about 5,000 hemlock ties that were subjected to the creosoting process. These ties I

do not believe to have been thoroughly treated. They seemed to be tolerably sound at the bottom, but are badly decayed on the surface, and the rail wears into them to a much greater extent than it does into those that were treated with chloride of zinc. There is probably not more than from 30 to 50 per cent. of these creosoted ties now in track, and these will, no doubt, be all taken out this summer.

I examined these ties, or what there was left of them, in June, 1883, finding few then in the track, but was fortunate, however, in finding several hundred that had just been taken up and piled along the track.

If I am correct, what can be expected of creosoted ties with but 6 to 10 lbs. of oil to the cubic foot, if used, as they are in this country, in direct contact with the rail, and what must we do to get best results in the preservation of our ties? Use a chair, as in England, or open, porous woods, and inject 50 to 75 cents' worth of oil into each tie; or will a double treatment, first with dead-oil and then with chloride of zinc, answer the purpose—the dead-oil to preserve the outer or exposed parts, which it will do, and the zinc chloride the central portions, which the oil does not penetrate to any considerable extent in our most desirable woods? So far as my observations and experiments go, I am satisfied that time will demonstrate that dead-oil and chloride of zinc, injected into ties and timber as proposed, will give the best results for money invested, and where dense woods are used, especially for ties, the best result, without regard to cost.

You may say that the old way of creosoting closed the pores, thereby keeping out moisture. Dead-oil will not keep moisture in or out of wood, like paint, tar, or pitch, for any considerable time. Moisture will not enter a creosoted tie above the surface of the water surrounding it, or without pressure; neither will it enter, except under same conditions, where the fiber is oiled. This being the case, your ties, under most conditions, will remain dry, and the zinc chloride should be protected.

Again, you seldom see decay in wood the fiber of which has once been covered with dead oil to such an extent as to be seen by the eye. The zinc-creosote process will, as I said before, distribute one-half or less oil in every part penetrated by the greater quantity when injected in the old way, and in such quantities as can be readily seen.

You may say, Would it not be better to first inject the chloride, and then the dead-oil? If the treatment were reversed, you would have to remove a portion of the moisture before the oil could be injected. Wood being one of our best non-conductors of heat, the process would be tedious, and timber or ties would be more or less injured by the long continued application of the heat required to evaporate sufficient moisture. In fact, the only cheap and practical way would be to air, dry or stack the timber until sufficient moisture has evaporated, and then apply the oil. I do not believe there would be anything gained by so doing, and it would add greatly to the cost.

With reference to the treatment of piling with dead-oil, as protection against the teredo, the old way is to inject all the oil the timber will take (which depends on the piles being more or less dry and the kind of wood operated on)—from one to three gallons to the cubic foot. The object of the zinc-creosote process is to economize in the quantity of oil used, and nothing more, and consists in first injecting, say, two-thirds (one-half may be found to answer) of the quantity used in the old way, and then, by substituting some other fluid for the oil, as chloride of zinc, air, or water, by pressure, compress or force the two-thirds previously injected solidly to the center, which leaves the two ends—the one in the mud or ground, the other above water—with their fibers virtually painted with the dead-oil, while the center of the pipe, or that portion in the water, is as well treated, and contains as much oil as would be the case if the whole quantity used had been oil. I would prefer an antiseptic for the second injection, as it would help to preserve that portion above water from decay.

Regenerative Retort Firing System for Small Gas Works.

[At the last meeting of the North British Association of Gas Managers Mr. T. Blyth, of Kingskettle, read the following paper. The paper is reprinted from the London *Journal*.]

Having been asked by the Committee of this Association to write a paper on the regenerative system of retort firing for small gas works, it was not without some hesitation that I agreed to approach the question, knowing, as I do, that I have had very little experience in the working of regenerative furnaces compared with many of those now present.

Having had a conference with Mr. MacPherson, of Kirkcaldy, on the regenerative system, and received a full explanation of the system, and being about to put in new retorts, I resolved to have a trial of this system, with an oven measuring 5 ft. 6 in. in breadth, and 6 ft. in height from the floor level, with three Ω-retorts 14 in. by 16 in. by 8 ft. long.

[The author then explained, by the aid of a diagram, the construction of the regenerator adopted by him. It consists of flues built of ordinary firebricks set on edge, and bricks placed flat on the top of these, forming 4-inch flues. The heat passes from the producer under the top retort, and travels backward and forward along the flues until it makes its exit by the chimney. The secondary air enters by the middle one of the three bottom flues, passes to the back of the oven, then enters the flue above and comes forward, and joins the gas from the producer.]

The heat in the setting is perfectly uniform from one end to the other. The flues are built so that they are easy of access should they happen to get choked up; but after having had them working for six months, and damped them down for the season about the middle of March, I have never had any trouble or obstruction in the flues. When I examined them this summer, when building a new producer, I found there was only about a shovelful of ash in the two uppermost ones; the others were quite clean.

As regards the size of the producer, it is built with circular bricks to form a 2-feet cylinder inside. It is 4 ft. in height, and the bottom of it stands only 2 ft. under the floor level. There is a clinkering port 6-in. square, built in the front at the bottom of the producer. My reason for adding this is that I had some trouble in clinkering, owing to the mouthpiece of the top retort being right over the producer cover, preventing the free use of the clinkering bar, and thus exposing the workman for a longer period than is desirable to the intense heat from the open producer. But by this means free access can be had to the bottom of the producer if required. In my experience the clinker forms on the producer 4 or 5 inches above where the primary air enters; but it is easily removed when proper access is obtained to it. I also had a ¾-inch malleable iron tube bent round the outside of the producer. This tube was connected with a small cistern, and had three stopcocks on it for water to drop into the portholes to raise steam; but it was of very little use, unless the water was dropping on the hot coke.

I have now another arrangement which I may explain. I procured a vessel to hold 30 gallons of water, and placed it on the top of the bench. This I filled with water by a force-pump, and from it lead a pipe for steam, which passes down the front of the bench. The heat which rises from the bench is sufficient to produce as much steam as I require. The cover of this vessel is surrounded by a water-lute 3 in. deep, to prevent the steam from escaping.

One advantage to be gained by this system in small gas works, such as those of Kingskettle (where only one man is on the night shift, and one on the day shift in the winter time—the fires having to be banked up by myself in the summer), is the little trouble it necessitates. As we all know, a stoker's work in small gas works is different from that in large gas works. In small works a stoker has coals to break, purifiers to clean, lime to prepare, tar to pump, etc.; and no doubt, anxious sometimes in the short days to get forward with his work, he may forget to attend to the furnace at the proper time—and filling up a furnace with cold coke when it is almost burned down means, in my experience, a quarter of an hour's loss of heat.

I hold that the regenerative system is the most practical and independent system of heating retorts in small gas works, as the producer can run from four to five hours with very little attention, and you can easily see by looking into the oven, by the flow of gas from the producer, when the fuel is nearly exhausted and requires recharging. Another advantage gained by this system is the conservation of heat in the retorts at night when banked up. By filling the producer full either of hot or cold coke you can run it from six to eight hours, as may be required, by the working of the secondary-air slides and the damper at the stalk. By doing this you will have a firmer heat in the morning; and this is of great importance in small gas works. With the old system, however, I always found that in the morning, after the furnace had been banked up all night, although the heat looked well, I could never produce the quantity of gas, by 200 cubic feet, from the first charge of three retorts that I did in the ordinary working. It also takes about half an hour after the clinkering of the furnace to get it into proper working order.

In my short experience with the regenerative furnace, when it had been banked up for six or eight hours I was able to produce from the first charge within 20 cubic feet of the ordinary working; and this certainly is a great advantage. Another advantage of the system is that less coke is required by ½ cwt. every four hours. I had a similar oven working alongside this one, with three retorts of the same dimensions fired with solid fuel, and it used 1½ cwt. of coke every four hours, while the regenerative system required only 1 cwt. every four hours, which enabled me to use more of those cannels which yield a coke of inferior quality. This is also a great saving, for I have found, in purchasing

such cannels, that 5s. and upward per ton can be saved on coal giving an inferior coke, which will produce the same quantity and quality of gas as those producing a good coke.

The expense of the oven, retorts, and producer as constructed at Kingskettle I find to be—

Three new retorts, at 36s. 3d. each	£5	8	9
650 firebricks	2	2	5
Bricks and castings for producer	1	18	0
Total	£9	9	2
Average cost per mouthpiece	£3	3	0½

I know the importance of this subject demands something very much better than I have laid before you; but I have merely given you the rough outline, as the time at my disposal would not permit me to do more.

At the close of the paper—

Mr. W. Foulis (Glasgow) said he thought Mr. Blyth deserved very great credit for the manner in which he had designed and constructed the furnace he had shown them. He had got it up in a way that certainly must be exceedingly cheap, and easily constructed. For small works he did not know that anything more perfect could be designed that would serve the purpose better. He was very much struck with Mr. Blyth being able to get such good results from so small a producer—a producer only 2 ft. by 4 ft. He considered it was a step in the right direction, where small settings were required. His purpose in rising was just to express his satisfaction with the paper which had been read, and with Mr. Blyth's enterprise in the matter. One thing he would say, that the method of getting steam, by placing the cistern on the top of the retort bench, was exceedingly ingenious.

Mr. J. Turnbull (Lauder) expressed the opinion that Mr. Blyth's furnace was considerably in advance of the one he (Mr. Turnbull) described in the paper he read before the Association last year, and it was in the right direction. They were all very glad to see an advance made, even for small works, and he thought Mr. Blyth deserved the thanks of the meeting for the very able paper he had presented.

The President, in closing the discussion, said he agreed that Mr. Blyth deserved their best thanks for coming forward with his paper, and for the interesting sketch he had given of his setting. Mr. Turnbull had alluded to the paper he gave the Association last year, and he (the President) thought Mr. Turnbull might go away gratified that his paper had been an incentive to Mr. Blyth. There was no doubt that in country gas works a great advance might be made by the introduction of gaseous fuel, and the sooner this was accomplished the better. He asked the members to give Mr. Blyth a hearty vote of thanks for his paper.

The motion was carried by acclamation.

Distribution by Alternating Currents.

The following report (read by Mr. M. M. Slattery, Chairman of Committee appointed to investigate the subject of the "Electrical Distribution by Alternating Currents") was presented at the Boston meeting of the National Electric Light Association:

One short year ago the commercial success of the branch of electric lighting in which induction coils are used was, by some of our best authorities, considered very problematical, but practical use of the induction system has not only succeeded in commercially converting high tension electricity to low tension for electric lighting purposes, but also high tension theoretical opponents by practical demonstration of facts.

Upon the occasion of the last convention, the extensive use of the induction system received its first authoritative indorsement by our esteemed friend, Dr. Otto A. Moses, and although he was by some considered over enthusiastic in his statements, time has served to prove the correctness of his views, and the realization of many of his anticipations.

We will go back six months, and, mentally, what do we see in this business from here? A few experimental plants scattered about in various parts of the country struggling for public recognition, and with the innumerable detail difficulties which dog the footsteps of every new departure; difficulties the magnitude of which are usually in proportion to our ignorance of their nature, and therefore more frequently than not unduly magnified.

Now, what have those difficulties been, and has the past six months' experience enabled the manufacturing companies engaged in this branch of business to eliminate them?

We find there were three factors in the induction system that required all the ability of the electrical engineer to work out and place upon a proper footing, namely, the dynamo machine, the induction coil, and the disposition of the external circuit to take the best advantage of the use of the induction coil.

Of course, there were alternating dynamos in existence, as were also induction coils, before this branch of business had acquired any prominence, but they were not such as would meet the new requirements.

We will first take the dynamo. It will be familiar to all of you that no matter how intimately acquainted you may be with the construction of dynamo machines, when you start in to build a new type, your previous experience, however valuable it may be, does not enable you to foresee innumerable detail difficulties which will assuredly develop with practical use, and which take time to ascertain and remedy.

Well, so far as we have been able to learn the weaknesses which developed in this apparatus were first, the liability of the current to jump across the coils in the event of the field being excited with the armature circuit open. This open circuit sometimes happened by a dead cross occurring in some place in the mains, blowing the fuse at the dynamo, thus opening the circuit, and then the field being fully excited, the armature would generate an exceedingly high electromotive force for an instant; the current, under the circumstances, would be very liable to jump across the coils of the armature, and other hurtful effects to the machine would ensue; the remedy for that was inserting at every branch in the external circuit a junction fuse, and at various points along the mains and sub-mains section fuses to such an extent as to make an open main a remote contingency. It was also found that the armatures heated excessively, owing to the presence of the plaguey Foucault currents. It was found that this evil could be almost wholly suppressed by building the armature without iron, and avoiding as much as possible the use of masses of metal in proximity with the armature coils. In this connection Siemens' early type of alternating dynamo, slightly modified to meet the new requirements, might read us a lesson.

It was a bold step when the alternating dynamos were constructed with iron cores, and those who make this class of machine for this high tension incandescent business might give us some interesting information. To my mind this iron core construction speaks of disagreeably high temperature. I do not say that they will not be able to present a rational theory why this evil may not be, or has been, greatly modified, but the fact existed in the past, and as far as we have been able to ascertain stands unrefuted at present. One thing, however, is pretty evident, that just now this type of machine appears to be finding a rather extensive use, evidencing that it must be doing good work. So much for the alternating current dynamo, a machine destined to play a most important part in the future electric lighting business, and in the light of the past experience no doubt should exist in the minds of anyone here that these dynamos in practical use are now almost, if not quite, as reliable as any other dynamo; while coupled with this is the important factor of a pretty close self-regulating property attainable in this system, without the necessity for any particular method of winding, that property following chiefly as the result of the use of the induction coils. It is satisfactory to know that during the probation of this system every accident of any importance which has occurred to the dynamos has been of a purely mechanical nature, and our mechanics have reduced them to a minimum.

No doubt the induction coils have been the source of considerable anxiety; not because there was any obstacle in the way of obtaining high electrical efficiency, as this latter appears not to have been by any means a difficult problem to solve. The source of greatest trouble has been, as far as I can learn, that of insulation. In what form will the weakness appear has been a question often asked himself by a timid electrician, and as usual the most unlooked-for troubles developed. At one time an unaccountable defect in the insulation of the secondary coil would occur, cutting out a number of convolutions, thereby causing an noyance by reducing the incandescence of the lamp in its circuit; the remedy was simple—increase the insulation of the wire and exercise still greater care. The same accident would still more frequently happen to the primary coil; the same remedy applied overcame it; sometimes a number of the layers of the primary coil would thus be suddenly cut out, resulting in the passage of a much heavier current than the fuse in the coil box had carrying capacity for; the fuse would then melt and possibly draw an arc that you had a great deal rather do without if you could; the remedy for that was, keep on insulating the primary coil layers from each other until the trouble ceased, and increase the distance between the ends of the primary fuse to such an extent that when the latter melted, an arc, no matter how great its volume, would not be able to bridge over the distance which, after all, was calculable because the E. M. F. was constant. Then, again, metallic con-

tact would take place between the induction coil and the iron box in which it was mounted, and if that box happened to be placed anywhere near a ground, possibly unpleasant electrical experiences might be related in wet weather. It was again only a question of looking out for the insulation to reduce such defects to a minimum; well, the insulation appears to have been looked out for, as the smooth and safe working of that branch of the business would now seem to testify, and to-day that part of the system can be made as reliable, simple, and as easily disposed of as any other part of an incandescent system.

Thus the two new and troublesome factors have gradually and surely been strengthened for their future work.

The next in the system, viz., that method of distribution which would enable you to utilize the induction coil to the best advantage, although apparently presenting the simplest problems at the outset, has required a great deal more thought than was anticipated. It was found that no particular rule, as in the case of low tension distribution, could be carried out, the methods of distribution varying with the condition of the district in which you had to distribute. In some cases the wires were run out from the central station through the center of distribution, and tapped at any point along the route where lights were required. This was the earliest and simplest form of distribution, and answers perfectly well for comparatively small installations, it being desirable to keep the loss in the mains down to about two per cent., and perhaps about two or three per cent. in the induction coils, so that the incandescence of the lamps should not vary appreciably throughout the system—this arrangement of the circuit may be carried out in small and very scattered towns where it has been found to answer admirably. In other cases where the district is more densely populated, and a large installation is required, the inductoriums are placed in the centers of distribution and used like so many stationary dynamos, the high tension primary current, with comparatively small conductors, feeding each of these centers, the secondary or distributing circuit being taken where lights are required; still other methods of distribution are carried out, but what has been stated in this connection will serve to show that again the past year's familiarity with the business has given an opportunity to perceive and profit by many advantages the system offers.

One of the last, but by no means the least, points that I shall touch upon in this interesting subject is the question of comparative cost of the main conductors required in installation of an induction and low tension incandescent plant. Not at all infrequently we shall find ourselves called upon to figure upon a plant like this:

From the source of generation to the point of distribution is one mile and a half, making a three-mile circuit; at the point of distribution you are required to distribute some 400 16-c. p. lamps, at, say, 5 per cent. fall of potential, which appears to be about the limit allowed the induction system. The conductors for this purpose in the induction systems now in use would be No. 2, Brown & Sharpe, which will cost about $230 per mile. In the case of the low tension installations upon the low tension system, you would require a conductor costing about $1,050 per mile.

Should you be required to distribute throughout the whole of the length of the circuit, wire such as is used for ordinary arc lighting purposes would be amply sufficient for the induction, and of course a proportional reduction may be made in the low tension.

Now, a great many exaggerated statements are made with regard to the dangerous shocks to be expected from this alternating current, and while I am not prepared to say that the physiological experience of a shock from a thousand-volt dynamo is the most agreeable thing in the world, I am prepared to say that the shock is by no means as severe as that received from a continuous current dynamo of the same voltage. A few weeks ago a man showed me his hands, which were horribly burned. He had received a shock from an 1,100-volt dynamo, and he said, with a visible tremor in his arms, as if the recollection of that shock was still vividly impressed upon his mind, that he experienced the effect of that shock for more than a week afterward. A friend of mine was testing a 400-light, 1,050-volt alternating dynamo, fully loaded, only a few days ago, and going towards the machine his foot slipped and he fell quite close to it; in his confusion he quickly reached out his hands and unfortunately placed them directly upon the poles of the dynamo. He said from where he fell to the wall behind him was about fifteen feet, and it seemed to him as if that dynamo was suddenly converted into an electrical gun, and he got shot across the room until the velocity of his movement was interfered with by the wall. There was scarcely the appearance of a burn on his hands, merely a pin's head matter, while the effect of the shock was felt by him only for a few hours. It might be said that the difference of effect of the shock was owing to the difference in the temperament of the two men; that may be so, but I have received three pretty severe shocks from a 1,000-volt alternating machine, and however much I may have felt inclined to dispense with the shaking up it gave me, the experience has been of value to me—one cannot have everything.

One word more in conclusion. The induction system has evidently come to stay, not because enthusiastic advocates think or say so, but because the expert public, the central station public, have practically indorsed it, because it more nearly than anything else meets their immediate and anticipates many of their future requirements. More especially is its advent doubly welcomed just now with this misconducted overhead conductor warfare pressing on every side, and which is every day acquiring seriousness in proportion to the increase of copper wire in the air, and I think that this system, with its comparatively small mass of conductors, will postpone for a considerable time the necessity of going under ground with the electric light wires until more extended experiments shall have given us the confidence in underground systems that experience in the past has materially shaken.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

St. Paul, Minn., Proposes to have a Grand Illumination.—A St. Paul correspondent, writing under date of 2d inst., says that "those who witnessed the grand street illumination in this city during the progress of the State Fair last year, and expected to see but a mere repetition of that spectacle this year, will be most agreeably disappointed. All the pleasing features of last year's illumination are to be reproduced, but new designs will be shown to make a sight that will completely outshine St. Paul's previous efforts in the direction indicated. The entire work of designing the plan of the illumination has been relegated to the able management of Wm. A. Slyke, who, ably seconded by the earnest efforts of many leading citizens, has been unremitting in his labors, and his promise is sufficient guarantee that everythtng will be in readiness at his end of the line when the Fair opens. The details of the lighting arrangements are about like the following: A row of lights will answer for the side illumination of Third street, from Sibley to Wabasha street. Beginning at the corner of Sibley and Third streets, large cross-arches will be erected at all the street crossings, up to Bridge square, at which point it is intended to place a lighting design of striking effectiveness and beauty. Besides the cross-arches at the the street corners, in the center of each block heavy double semicircles of lamps will be thrown across Third street. Over the sidewalks lengths of tubes have been run to the buildings on either side, to serve the double purpose of supporting the tubing along the curbstones, and also to carry a number of incandescent electric lights. The sidewalks will have a line of lights extending from Sibley to Wabasha streets, and the arches at the street corners, with the intermediate arches in the center of each block, will form an illuminated covering or canopy over the roadway. On Wabasha street double arches will be placed at Fifth street, and near the Capitol. The line of light on the sidewalks will extend from Third street to the Capitol. Other lines of illumination follow on Robert street, from Third to Seventh; on Jackson, from Third to Seventh; on Sibley, from Third to Seventh; and on Seventh, from Jackson to Broadway, with four arches within that distance. Colored globes (six different shades) will cause the illumination to have a rich effect. For instance, the arch at the corner of Third and Sibley streets will be finished in ruby colored globes; the globes on the next arch on Third street are to be of an amber hue; at the corner of Third and Jackson blue globes will be employed, while at the corner of Third and Cedar an arch of ruby globes, surmounted by a crown of crystal, will be the fact. The crowning triumph, however, of the illumination is intended to occur at Bridge square. Surrounding the electric light mast at that point arches of colored globes will run to all the street corners, and to posts on West Third street. This will be joined by a large ring of tubing completely encircling the mast. On this ring spires of light are to be arranged, and trees of colored globes are to be placed on all the arches, the whole forming a magnificent canopy of lights, the effect of which it is believed will surpass anything heretofore attempted in a similar direction. Let me close my hasty and, I fear, hardly intelligible description by saying that during Fair week Third street is to be closed to vehicle traffic every evening at 7 o'clock, when the roadway is to be thoroughly swept in order that it may be used for a public promenade. Concerts are to be given every evening, three bands having been engaged to play at stands to be erected in the center of every alternate block." It will be noted that our correspondent fails to say whether or not gas is to be called on to furnish the greater portion of the light required, but we presume he means us to infer that such is to be the case. At all events, "Fair Week" promises to be a bright one

on the St. Paul calendar, and we would like to be on hand to witness the spectacle.

MAKING NO CHARGE FOR PUTTING IN SERVICES.—The Municipal Gas Company, of Albany, N. Y., advertises that those who wish gas services laid on to their houses, etc., can have that work done at the Company's expense, provided notice of such intention is given to the Company on or before Nov. 15 next. That is liberal, and should result in the placing of many new meters.

AS TO ITS LEGALITY.—Corporation Counsel Green (Chicago, Ills.) it is said will present his report in (regard to the legality or otherwise of the Gas Trust formed some time ago in that city) to the Common Council, in time to be read at the session to be held on the 26th inst. He has forwarded a list of questions to those in subsidiary control of the companies forming the Trust, and expects to incorporate the replies thereto in his message to the Council. Some of the legal and financial experts of Chicago confidently assert that the Equitable and Consumers' Companies' charters, upon a fair construction of their terms, preclude them from legally acting as members of the Trust.

THE PROPOSED SALE OF THE HALIFAX (N. S.) GAS WORKS.—It was generally supposed that all the preliminary details necessary to a transfer of the Halifax plant and franchises had been arranged, but that conclusion appears to have been premature, for, according to advices bearing date of August 29, it seems that only a small attendance of shareholders greeted Chairman Boak at the meeting (held on August 27) which was to decide the questson. Our informant then goes on to say that, "While the meeting was supposed to be of the most secret nature, all the facts have leaked out. The Hon. Robt. Boak read the offer of J. R. Bothwell for the purchase of the franchises, privileges and property of the company, which proposition was, in effect, as follows: $500,000, one-half to be paid within thirty days of the acceptance of the offer, the remainder within sixty days; Mr. Bothwell to complete all existing contracts, and the other assets of the company, in the shape of coal, etc., to be paid for in addition to the purchase money named. The buyer agreed to deposit $100,000 in cash, to bind the contract, $50,000 of which was to be deposited on or before ——, the remainder shortly thereafter, $50,000 to be forfeited if the buyer did not adhere faithfully to the terms of the proposition. [It should be said here that the Bothwell bid had been accepted by the Directors at a previous meeting, the session under consideration being called to secure the acquiescence of the shareholders.] Bothwell, it seems, shortly before the shareholders' meeting, repented his rashness, and failed to deposit the $50,000, giving as a reason therefor that he had been informed by his solicitor that, before the company could tranfer its property, it would have to secure the passage of an enabling legislative act, and that as the Legislature would not meet for several months his (Bothwell's) financial arrangements had been sadly interfered with. When the state of affairs was disclosed to the shareholders, they, after much discussion, passed a resolution to the effect 'that the Directors have power to negotiate a sale at such time and terms as they deem advisable.' This resolution does not amount to much, for, no matter what the Directors decide upon, such decision (according to the Company's franchise) is of necessity subject to ratification by the shareholders. Meanwhile the projected 'deal' hangs fire, and some people predict that it will never 'go off.' In my opinion, this is too valuable a property to be hawked about the market."

WOULD LIKE TO GET A FRANCHISE.—Towards the end of last month the projectors of the Economic Light and Heat Company asked permission, through an ordinance submitted to the Council of Lake, Ills., to lay gas mains through the streets of the town. They agreed to supply gas for public purposes at price not to exceed $1.25 per thousand cubic feet; to others, gas for heating purposes at $1.25, and gas for illuminating demands at $1.50. The gas was to have an illuminating value of not less than 25 candles. The matter was referred.

WASTED GAS.—In Omaha, Neb., something over a fortnight ago, a gas main passing under the Eighteenth street bridge was fractured, and the Gas Company lost thereby about 150,000 cubic feet of gas.

CONSOLIDATED.—The Meriden (Conn.) Gas Company and the Meriden Electric Light Company joined forces on the 1st inst. The capital stock was adjusted at $250,000, and Mr. George R. Curtis, formerly President of the Gas Company, was elected President of the combined venture.

NEWS FROM BIRMINGHAM, CONN.—We note that the Derby Gas Company is building a dumping station on Derby avenue, on a plot of land recently purchased from John Coleman.

INSTRUCTING THE INSPECTORS.—Hereafter, in consequence of a resolution passed by the Philadelphia authorities, the Department of Public Works has been requested to instruct its inspectors of gas meters to leave a copy of their report, showing the state of the gas meter, with each householder when the monthly readings have been made.

INCORPORATED—Articles incorporating the Cicero Water, Gas and Electric Light Company to operate at Oak Park, Ills., have been filed. The capital stock is returned at $65,000, and E. S. Conway, O. W. Herrick and W. M. Luff are named as the incorporators. Oak Park is in Cicero township, Cook County, Ills., and is on the Des Plains river (also the Chicago and Northwestern Railroad) at a point 8½ miles west of Chicago. Population, about 4,500.

THE AMERICAN GAS IMPROVEMENT COMPANY.—This Company has plenty of business on hand, and more coming in. We note that plants on the McKay-Critchlow system have been recently completed and put in operation at Sharon, Pa.; Fostoria, Ohio; and Fort Scott, Kansas, while Tiffin and Wellsville, Ohio, are now being equipped on the same plan.

ORLANDO, Florida, is now lighted by gas, and the residents are happy.

A NEWSY LETTER FROM BRO. DUNBAR.—Supt. J. W. Dunbar, of the New Albany (Ind.) Gas Light and Coke Company, writing under date of Sept. 1, says: "We have added to our gas plant, by purchase from the American Electric Manufacturing Company, a complete specimen of the electric lighting outfit supplied by that Company, and expect to have the same in perfect running order by the first of October. We purpose to supply the arc light, and have determined to operate what I might call an early and late circuit, lights on the former to be extinguished at 9:30 P.M., those on the latter to be put out at midnight. We propose to charge $75 each per annum for the short-hour supply, the longer service to be paid for at the rate of $100 per lamp per annum. These are to be strictly commercial lights, since it is not our intention to light the streets with electricity. We believe that all gas companies should turn their attention to the joint supply of gas and electricity, so that consumers can be supplied with whatever description of lighting agent they choose to demand. I am firmly of the opinion that a gas company can make a greater profit out of the supply of electric light than can be made by those who seek to supply it independently; and there is no doubt but that we will be able to make as large a percentage of profit from our electric business as we do from our gas business—all things taken into consideration. Our initial capacity will be that from a 50-light dynamo, but that is likely to be increased to a 100-light machine by the 1st of January, 1888. We now light 475 gas lamps on the streets of our city, for which we are paid only at the rate of $18 per post per annum. We are obliged for that sum to keep the lamps in repair, and to light on those nights when the moon is obscured. On account of the dense foliage of our shade trees, joined to the fact that the lighting is performed at such a cheap rate, the authorities do not think it would be wisdom on their part to try electricity for street illumination. Our bills for gas supplied to ordinary consumers are made out on the basis of $2.10 per thousand cubic feet, where the monthly consumption is in excess of 3,000 cu. ft., while those who use less than that quantity are charged $2.35 per thousand. One year ago we charged $2.45 and $2.70 per thousand, and since the reduction went into effect a comparison of send-out quantities shows that so far this year we have sold 13 per cent. more gas than for same time last year. Southern Indiana has been overrun by parties engaged in the search for natural gas, but despite the activity of the drillers only surface gas, not sufficient in volume to permit of its utilization, has been obtained. In all these wells the drills have penetrated the Trenton, but results, as well as the prospects, have been most unsatisfactory. In fact the repeated failures have about convinced the prospectors that Southern Indiana is not in the 'gas belt.' About a year ago your correspondent, 'Retort,' mentioned that, at De Pauu's plate glass works, located in this city, fuel gas was to be manufactured and used for fuel purposes. He also said that the proposed new departure was attracting a great share of attention. Now, as to the final results of the glass works experiment. About $100,000 was expended in the development of the project, but, for some reason or another, the trial ended in complete failue. At the present time the owners of the glass works are drilling on their premises, the bore-hole having already reached a depth of 2,300 feet, at which point it is thought the Trenton ought to have been reached. They will admit a failure if gas is not encountered on or before the drills sink to a depth of 3,500 feet."

SALE OF THE FLUSHING (L. I.) ELECTRIC LIGHT FRANCHISE.—Some time ago we noted that the authorities of Flushing were anxious to sell

at public auction the right to operate an electric lighting plant in that village. The original date named for holding the sale was Aug. 1, but in consequence of the absence of bidders a postponement to the first Monday of September was ordered. The second attempt resulted in a sale, although only two bidders put in an appearance; but the residents of the handsome Long Island village are quite satisfied at the figure obtained. Mr. J. H. Wilson, President of the Board of Trustees, acted as auctioneer, and after some spirited bidding the franchise was sold to Mr. E. H. Hurst, who represented an Eastern Company, it is said. He agreed to pay into the village treasury 25 per cent. of the gross earnings during each year in which the plant remained in operation. A resident of Flushing, in commenting on the terms of the bargain, said he doubted whether any company could pay such an exorbitant rental, and carry on business for any length of time.

RESTORED.—The plant of the Homer and Cortland (N. Y.) Gas Light Company, which suffered somewhat severely from damage by fire not long since, is being restored on a decidedly substantial scale. Two fireproof building (constructed of stone, topped with substantial roofs) are being erected, the larger of which (124 ft. by 29 ft.) is intended to house the coal supplies, while the other (75 ft. by 25 ft.) will be devoted to coke, lime, etc., storage. Locomotive sparks will no more cause trouble to the Homer & Cortland gas men, and Bro. Wood is one of the latter.

A BRISK TRADE IN THE CONNELLY & CO. SPECIALTIES.—The Messrs. Connelly have no reason to find fault with their list of shipments for the month of August. The returns show the following sales and deliveries for the period in question: *Automatic Governors.*—One 20-inch to Grand Rapids, Mich.; one 16-inch, to St. Louis, Mo., and 2 to Dayton, O.; 12-inch to Chattanooga, Tenn.; 10-inch to Wichita, Kas.; 8-inch (1 each) to Johnstown, N. Y., Chillicothe, Ohio, and Victoria, British Columbia; and 6-inch to Beverly, Mass. *Iron Sponge.*—8,000 bushels to Equitable Company, N. Y. City; 5,000 bushels to Phila., Pa., gas works; 800 bushels to San Diego, Cal.; 100 bushels to Fostoria, Ohio; 600 bushels to Plainfield, N. J.; 75 bushels to Cadiz, Ohio, and 50 bushels to Evanston, Ills. *Gas Exhausters.*—6-inch instruments of this class were shipped to Lewisburg, Pa., Perth Amboy, N. J., and Cardenas, Cuba. A pretty well distributed trade, and all will concede that these enterprising merchants merit the success that has attended their efforts.

ANOTHER GAS THIEF.—A man named W. Spielmeyer, a resident of No. 1009 North Bond street, Baltimore, has been indicted by a grand jury of that city on a charge of violating the Maryland act intended to protect gas companies from the depredations of those who surreptitiously tap gas mains. The defendant made free with a main of the Consolidated Gas Light Company, which would seem to indicate that he is a purloiner with decidedly small ideas, for gas is pretty cheap in Baltimore just now. He gave bail for trial. Spielmeyer's knavery was discovered by one of the private detectives employed by the Baltimore detective agency of Smith, West & Lyons.

THE HALIFAX (N. S.) GAS COMPANY FAVORS THE JARVIS FURNACE.—The proprietors of the Halifax Gas Light Company, thinking that economy means money, are equipping two boilers with the Jarvis Furnace, in order that wetted coke can be used for fuel. It is claimed that thoroughly wetted coke, when consumed under boilers set with the Jarvis Furnace, which system permits of the delivery of a supply of hot air above the fire proper, insures an intense heat, the same being gained at a very low cost Boilers set in the way above noted are now in operation at the following gas works: Charlestown and Brookline, Mass., Burlington, Vt., and Schenectady, N. Y.

ANNUAL ELECTION PROVIDENCE (R. I.) GAS COMPANY.—A Providence correspondent writes that "the stockholders of the Gas Company met at noon, Monday, Sept. 5, President A. C. Barstow occupying the chair. The President read the annual report of the Directors (it was quite brief), and the same was accepted, approved and filed. The report conveyed the information that about three miles of main pipe had been laid during the year, the total length of pipe now owned by the Company aggregating 154 miles. The price of gas had been reduced from $1.70 to $1.50 per thousand cubic feet, no distinction being made between the city or private consumers. The use of gas stoves and gas ranges was steadily increasing, and it seemed to be the general opinion among those who used them that gas cookers were economical in the items of time, money and convenience. When the report was disposed of, the ballot for a Board of Directors resulted in the selection of the following: Messrs. Wm. Goddard, Amos C. Barstow, Alpheus B. Slater, Royal C. Taft, Edward Bierce, Jesse Metcalf, Amos N. Beckwith, Geo. W. R. Matteson and Lucien Sharpe. Subsequently the Directors organized by electing Amos C. Barstow, President; Wm. Goddard, Vice-President; A. B. Slater (of course) being named Secretary and Treasurer. The business of the Company is in an eminently satisfactory condition, and those in charge thereof are entitled to all possible praise." Since we completely agree with our correspondent in his final expression of opinion, we have only to respond, "Amen!"

PUBLIC LIGHTING AT PORTLAND, OREGON.—The authorities of Oregon have asked for proposals for the public lighting of that city, but have concluded to be somewhat more liberal than their original plan seemed to indicate. The initial suggestion was to the effect that the city should only ask for bids for oil lamps, but the "dark age" advocates were finally induced to grant gas and electricity a chance in the field. Of course, there would be no trouble in obtaining a plentiful supply of gas, but the electric lighting end of the proposition is involved in a pretty thick cloud of doubt. It is reported that a Mr. Hogue intends to put up an electric light plant near a large sawmill (located on Water street) owned by him, but some of the Councilmen are afraid that, should Hogue put in a bid and secure a contract for the city lighting, his plant might not be completed in time to do the work. Very nice reasoning (on the part of a Councilman), no doubt, but is it not fair to assume that Hogue knows what he is about. However, Portland is ruled by a remarkably queer collection of city fathers, and the Portland Gas Company will, we think, coincide in that opinion; but we respectfully suggest that they give Hogue a chance, for they cannot, in any event, act in the future more meanly towards him than they did with the Gas Company in the past.

TOPEKA, KAS., SIMILARLY AFFECTED.—Writing about City Councilmen, and the surprising fondness exhibited by many of them for kerosene oil, etc., as a street lighting agent, puts us in mind of a letter recently received by the JOURNAL from J. T. Clark, Secretary of the Excelsior Coke and Gas Company, of Topeka, Kansas Our correspondent takes us to task for an inaccuracy that occurred in "Retort's" letter, published in our last issue, in which it was stated that the City Council of Topeka, after refusing to renew its contract with the Gas Company, had awarded the public lighting of the city to the Brush Electric Light Company. Accepting Secretary Clark's disclaimer and rebuke with that humility so characteristic of those who "write for the press," we herewith cheerfully (because we wish to straighten out the mistake) and sadly (because Topeka is in the hands of such unprogressive rulers) publish his concise account of just what action was taken by Topeka's City Fathers anent the public lighting contract. The Secretary says: "Our City Council have not contracted with the Brush Electric Light Company for lighting the city by the tower or any other electric system, and there is no probability that it will be done. Our City Council have, on the contrary, ordered the whole city lighted with *oil lamps*, although our Company proposed to furnish gas light, fully equal in quality to the best in use in any city of the country, at a *less cost* than is paid for the common oil lamps. Surely our Council must have imagined themselves back in the dark ages, and were fearful too much light might hurt their eyes." Could it be, Mr. Secretary, that the Councilmen, instead of being fearful about having their eyes dazzled, were actuated by reasons which might have affected their personal pockets? If such a consummation were reached in this section of the country, a grand jury might be called upon to take a look over the proceedings that led to the adoption of a contract contrary in every sense to the efficient and cheap service of those whom it was intended to benefit.

OFFERING TO LEASE THE WORKS.—It is reported that a proposition to lease that plant has been made to the proprietors of the Lebanon (Pa.) Gas Company. The proposers offer to take the works for 99 years at a rental of 10 per cent. on the capital stock ($70,000), with the option of buying out the Company at any time within the first 10 years of the life of the leasehold, for the sum of $100,000. One reason advanced in favor of the lease, by those who are anxious to secure it, is that the electric light is likely to seriously interfere with the Lebanon gas supply. But, if so, would not that fact equally interfere with the prosperity of those who are now negotiating for the property?

THE GLEASON COMPANY CONTROLS THE SALE OF THE GREGORY BURNERS.—Mr. George H. Gregory, patentee and former manufacturer of the "Retort" and "Incandescent" gas burner specialties, has given notice to the trade that the Gleason Manufacturing Company has purchased the exclusive right to manufacture and sell the burners and lamps protected by patents issued to Mr. Gregory on Oct. 31, 1882, and May 31, 1887.

SOMETHING MORE ABOUT THE PETITION FOR THE TOWN OF LAKE GAS FRANCHISE.—Elsewhere we note that a petition had been made to the to the Board of Trustees, of Lake, Ills., for the right to operate a gas works in the locality named. Later advices state that Mr. C. E. Judson, President of the Lake Gas Company, forwarded a letter to the Trustees in which he called attention to the fact that by an ordinance previously granted to the Northwestern Gas Company the exclusive right to lay gas mains within Lake township was granted to the incorporators of that Company for a period of 30 years. President Judson says that his Company would insist upon that right, and if the Board intended granting any other Company a right which would interfere with the present Company, or the exclusive right granted it, legal proceedings would be instituted. The letter was referred to a committee, the members whereof recommended that it be placed on file. President Sherwood, of the Economic (opposition) Light and Heat Company was present and addressed the Board on the subject, stating that himself and associates intended to furnish a good gas at much cheaper rates than those charged by President Judson's Company. He (Sherwood) said if the Board granted the ordinance asked for a bond indemnifying the town against the results of any suit for damages that might be brought would be entered into. And thus the matter stands.

ANOTHER OPPOSITION COMPANY.—Articles incorporating the Zenith Gas and Water Company, of Duluth, Minnesota, have been filed. The capital stock is placed at $500,000; those comprising the initial Board of Directors are Messrs. Prosper L. Knappen, D. Pineo, H. H. Bell, A. J. Whiteman, G. G. Hartley, R. C. Mitchell and C. M. Parkhurst; and it is proposed to manufacture gas under the system for which patents have been granted to T. G. Hall.

BRO. CRESSLER KEEPS IT UP.—The Kerr Murray Manufacturing Company, of Fort Wayne, Ind., report that their latest contracts include the following: Single lift holder, 50 ft. in diameter by 20 ft. in depth, for the Saginaw (Mich.) Gas Light Company; 2 benches of 6's, to be fired with improved furnaces, for the Fuel Gas and Electric Engineering Company, Pittsburg, Pa.; 4 benches of 6's, fitted with the "Doty" anti-seal dip and bridge pipes, for the Memphis (Tenn.) Gas Light Company; extension to the Chattanooga (Tenn.) Gas Light Company's plant, consisting of 4 annular frictional condensers, 36 ft. in diameter by 24 ft. in height; 1 tower washer, 7 ft. in diameter by 25 ft. in height; 1 set of purifiers, 20 ft. by 20 ft., and 5 ft. in depth, with 16-inch center seal and connections and hydraulic lifting apparatus for operating covers to boxes.

GOING AHEAD AT WICHITA, KANSAS.—The proprietors of the Wichita Gas, Electric Light and Power Company are progressing steadily. A wideawake correspondent in that bustling city informs us that the gas plant is being put in fine condition for the winter's calls upon it, the improvements embracing 3 benches (additional) of 6's and a double lift (62 ft. in diameter) holder. He adds: "Despite the fact that 400 arc electric lights are in duty, the Company confidently expects this winter to treble the quantity of gas that was sent out in the corresponding season of a twelvemonth ago." The main system has been extended through 5 miles of new gas territory. The Wichita men are going ahead.

NEGOTIATING.—We understand that it is quite probable that Mr. M. McMillin, present lessee of the Marietta (Ohio) gas works is about to dispose of the property.

DOES IT MEAN A WAR OF RATES?—In our last we published a new schedule of rates promulgated by the old Poughkeepsie (N. Y.) Gas Light Company. Shortly after came an announcement from those interested in the management of the Citizens' Gas Light Company (same city) that from and after first inst. the following rates would prevail:

Quarterly Consumption.	Rate per M.
Less than 4,000 cu. ft.	$1.75
Over 4,000 but under 7,000 cu. ft.	1.50
" 7,000 " " 10,000 "	1.25
" 10,000 "	1.00

Ten per cent. to be added to the face of bills remaining unpaid 10 days from date of presentation. The Citizens Company's schedule being lower than that advertised by the Poughkeepsie Company, the latter immediately conformed its rates to those instituted by its rival. All of which seems to indicate that Poughkeepsie is to have another war of gas rates.

NEW GAS COMPANY.—Ths Los Guilicos (Cal.) Water, Light and Improvement Company has been incorporated, with the right to supply both gas and electricity. The capital stock is $250,000, and Messrs. J. M. Donahue, N. W. Griswold, A. S. Rhorer, W. J. J. Matthews and H. N. Bird are the interested parties.

ELECTRIC LIGHT AT LOUISVILLE, KY.—The Louisville offshoot of the United States Electric Light Company is engaged in a desperate attempt to popularize incandescent electric lighting in that city. We understand that 16-candle power power lamps have been offered to the residents at as low a rate as 75 cents each per month. Who can figure out a profit to the suppliers thereof on that basis of working?

Western Waifs.

BY DIAPHRAGM.

THE outlook for business throughout the territory that I visited during the fortnight looks most promising, and gas men are more than hopeful about a gratifying increase during the coming year. In the language of the day, this is as it should be.

THE ever-popular Cosgrove, of Evanston, Ill., is busy putting down 3,000 feet of 10-inch main, that addition being found necessary to meet the increasing gas demands of his growing city. Additional improvements comprise a new 40-horse power boiler, an 18 by 4 scrubber and a bench of 3's.

SUPERINTENDENT Wright, of La Porte, Ind., has reported for duty after enjoying a well-deserved and pleasantly-spent month's vacation at Newport. Quite an addition is being made to the retort-house capacity at La Porte.

THE gratifying increase in consumption at South Bend, Ind., this summer is to be traced to Supt. Perkins' successful introduction of a large number of gas stoves.

SUPT. Raynor, of Adrian, Mich., who wears a pleasant smile, says: "Business has been very good, and prospects are excellent. We are putting in a new setting of 5's."

AT Elkhart, Ind., Supt. Murdock is busily engaged in altering the plant from a 6 to an 8-inch one. When the season's work will have been finished his main system will be larger, for he has put down 2 miles of 3-inch pipes, and is to bury some 4-inch lines. These extensions were absolutely necessary, because of the material growth of the city. In his dual capacity as the "gas and water man," Bro. Murdock, like the proverbial bee, is "kept humming."

OVER a mile of 4-inch pipe is necessary to reach the paper mills to the south of Niles, Mich., but Supt. Kirkham says it will be put down at once.

THE old retort house at Fort Wayne, Ind., is being raised 4 feet and is to be covered with an iron roof. To take care of the unexpected increase in the demand for more gas, new arches have been erected, and 4 benches of 6's have been placed therein. J. M. Wood is the gentleman who succeeded C. S. Knight as Superintendent.

AFTER several years of unceasing labor, Supt. G. A. Hyde, jr., of East Saginaw, Mich., has a model works, in which he justly takes great pride. This summer he found time to work up the gas stove business, and made marvellous progress at the work. Two new settings of 5's are being put in, a new forge and blower are recent additions, while a new and well-built dock (65 by 130), to facilitate the handling of coal, has just been completed. The writer has occasion to visit numerous gas works, and, for a demonstration of the theory that "cleanliness is next to cheap gas," Mr. Hyde wins the laurels.

SUPT. W. W. Prichard, of Ironton, O., is back at his post, after a lively shirmish with erysipelas. A new setting of 4's has been put in at the Ironton works, and Mr. P. announces that he is now ready for the fall campaign.

NOTWITHSTANDING the decided opposition of the local electric lighting companies, the Bay City (Mich.) Gas Light Company seems to thrive under Supt. Calhoun's conservative management. He will place 2,000 feet of 3-inch pipe this month, and erect 2 new settings (one of 5's, the other of 3's), which goes to prove the residents of Bay City are appreciative people. Mr. Calhoun hopes to announce a reduction in price shortly.

CHAS. NEUENDORF is the new Secretary and Superintendent of the Saginaw City (Mich.) Gas Light Company, vice N. Cameron. The Kerr-Murray folks have almost completed a new 50 by 20 holder for this Company. Extensive improvements are to be made next season.

THE Parker-Russell folks are setting 3 new benches of 5's for the Lima (Ohio) Gas Company. The furnaces are arranged to consume oil for fuel.

THE new (350,000 cub. ft. capacity) telescopic holder for the Grand Rapids (Mich.) Gas Light Company is nearly completed. The recent reduction in prices (noted in last issue of JOURNAL) will be the more appreciated by consumers when it is considered that the same was voluntary—no outside influence figuring as a factor in the action taken.

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FRIDAY, SEPT. 16, 1887.

Hints to Gas Managers.

Mr. Geo. Anderson, C.E., writing to the *Gas World*, believes that the following "hints" afford the outlines of a plan which, if carefully followed, will assist the prudent gas manager greatly in the conduct of his business:

1. Get pulling down for repairs done at odd times when hands can be spared, rather than employ extra labor, and don't employ skilled labor on it except where necessary.

2. The above especially applies to retorts. Cause all old bricks, whole or broken, to be cleand and rebuilt, especially in parts of the work where heat is not intense—such as in bottom of ashpits, filling in front round retorts, extreme back end of oven, top flues, and the like.

3. Old bolts and washers keep in a state of repair aad use up before going to stock for new ones—same applies to pieces of service pipes, old cocks, etc.

4. Keep good heats, tight retorts and lids, coals dry, charge evenly spread, and as heavy as can be fairly burned off, and always backed in from the front so that no part of the charge is nearer than 18 inches from front of mouth piece, and no leakages on any part of the works, especially in the retort house.

5. Never clinker after but always before the charge, nor let the fuel in the furnace get so low as to have holes through it.

6. Return as much as possible of pan breeze to fuel, and only breeze and clinkers to be sent out to yard.

7. Never charge all the retorts in a setting at the one draw, but rather one or two in each of several settings, thus better maintaining a good heat.

8. Never let carbon gather on the back end of a retort nor on any other part over an inch in thickness, but scurf when it is needed whenever you have retorts to spare, which may be at least every Monday, and don't scurf with an open retort, but insert a piece of cast-iron pipe through a hole in an old lid; lute up at front and take off bonnet at top of ascension pipe to cause a circulation of air through the retort, which will clean out the pipe; and remove the lid from time to time, and with a sharp bar some of the scale may be removed, and let the first, or it may be also the second charge after scurfing, be of breeze and tar, or till the retort is tight. This you can observe at the chimney top. There never should be smoke at any chimney top, but especially at the chimney of a gas works where smokeless fuel is mostly used—therefore smoke at the chimney top is a loss to you and to me, and it is both your duty and your interest to inquire into and remove the cause of it.

9. I presume that you observe, as you pass every morning, the condition of the various pressure gauges over the works and note any change, and are never caught by pipes being so stopped as to cause gas to burst through the apparatus, and perhaps require make of gas to be stopped till pipes are cleared out. Such a manager may be compared to a traveler who, in broad daylight, walks plump into a deep hole while there is a finger-post telling him to avoid it.

10. Keep your charges as evenly spread over time as possible, so that make of gas may be nearly uniform at all times. By this your manufacturing plant, condensers, exhausters, washers, scrubbers, purifiers and station meter will do their work better, and more of it in a given time, than if the make of gas is irregular from hour to hour.

11. Always know the hours at which charges should be on, and, if you are near, give a look as you pass; you may be able to detect things that escape the notice of the men.

12. Don't allow retort lids to be exploded; it shakes the retorts and annoys the neighborhood.

13. As far as your apparatus is capable, remove every trace of ammonia from the gas before it enters the purifiers; therefore, inspect the action of your washers and scrubbers.

14. Fill lime purifiers as full as they will hold of lime, as wet as it can be made (while retaining its shape, and not falling into mortar); don't hesitate, though the layer on a tray be 12 inches thick; lime to be newly slaked, but cool, and don't fear lime thus wet giving much pressure—the wetter it is the less pressure it gives (always providing it does not cake into mortar), and the more work it will do, and have the least odor when taken out.

15. Lime purifiers need not be changed till you find carbonic acid at the middle of the last lime purifier when you have oxide ones to follow. Never allow carbonic acid to be in your purified gas.

16. In filling oxide purifiers, leave at least an inch of space between each layer, or, say, 12 to 15 per cent. of empty space, as it swells as it absorbs sulphur from the gas.

17. You will find the oxide to do more duty if you let about 1½ per cent. of air pass in with the gas, but this must be regulated so as, on no account, to injure the gas.

18. Keep your gas as uniform in illuminating power as is possible, and always over the standard. You will have fewer complaints with uniform 14-candle gas than with gas that varies from 14 to 18 candles—it is the differences that most people notice. The same applies to pressure of supply.

19. Test the day consumption by the meter provided for that purpose, at least once a week, always at the same hour and at same pressure. Such an observation has led us to look for a leak, and discover a broken main which otherwise might not have been discovered till much gas had been lost.

20. Have meter indices read at the fixed periods that your accounts may compare with the corresponding periods, and you will save yourself much trouble with customers. For the same reason, the water line of meters should be kept uniform by frequent inspection.

21. Do all you can to instruct consumers in the right use of gas—good burners, staunch pipes—so that they may get the full value of the gas. Thus you will extend its use.

22. Should your advice be received with suspicion—even should you receive a brusque reception from some—never mind that, but consider that out of hundreds of customers there will always be some who are laboring under some malady of mind or body that has upset them, and put it down to that, and never lose your temper.

23. Conduct your business so as to never require to make an apology. Stick to your colors, and always behave like a gentleman.

In New Quarters.

As intimated in a former issue, the principal offices of the American Water Works and Guarantee Company (which Company, among other ventures, controls the gas works at Muncie and Marion, Ind., Galion, Ohio, and Braddock, Pa.) are now located in the premises known as the "English Block," Pittsburgh, Pa. We are also informed that Mr. A. B. Stannard is no longer in the Company's employ.

The Market for Gas Securities.

The local market for gas securities is absolutely featureless, although average quotations for the fortnight show that the bears were not so pronounced in their hostility to Consolidated shares. While dullness is the ruling factor and the brokers are loudly complaining thereat, it is quite likely that October is to be a busy month, for some inquiry has been made by out-of-town parties for certain New York and Brooklyn gas specialties. To-day (noon, Sept. 14) Consolidated is quoted at 73 to 74, but no large lot could be purchased, in our opinion, at a lower figure than 75. Mutual gas is more firmly held—it shows an advance of something like 3 points for the fortnight—and we incline to the view that Mutual will shortly be considered cheap at 105. Brooklyn shares have been neglected, but beyond doubt are cheap at ruling figures—that comment being especially trustworthy in connection with Williamsburgh and Nassau.

The out-of-town situation is also enveloped in lethargy; but holders seem in no way disposed to seek for a market. A bulletin (dated Sept. 12) from the publishers of the Boston "News Bureau" states that the "Bay State gas syndicate seems no nearer gaining control than several months ago. The extension of the Bay State system, however, goes on rapidly, and its large pipe will reach Chester Park in a few days. Boston gas people claim no figures have been mentioned. They have put the matter in the hands of a committee, with instructions not to consider any offer under $1,200 per share." Cincinnati gas is a trifle weaker, while Consolidated of Baltimore has advanced.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

SEPTEMBER 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	74	—
Central	440,000	50	30	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	115	120
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	113
Mutual	3,500,000	100	95	98
" Bonds	1,500,000	1000	101	—
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	—	80
Richmond Co., S. I.	300,000	50	50	—
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	100	102
Citizens	1,200,000	20	—	57
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	130	132
" Bonds	300,000		—	106
Peoples	1,000,000	10	58	61
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	78	80
Nassau	1,000,000	25	100	104
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	115	120
" Bonds	1,000,000	—	111	—
Out of Town Gas Companies.				
Boston (Mass.) Gas Co.	2,500,000	500	204	208
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	140	145
" " Bonds.	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	45	50
Cincinnati G. & C. Co.	6,000,000	100	182½	185
Consolidated, Balt.	6,000,000	100	56	56½
" Bonds	3,600,000		107	107½
Chesapeake, Balt.	1,500,000	100	—	75
"	1,000,000		100	102
Consumers Toronto	1,000,000	50	192	—

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 184
Wm. Henry White, New York City ... 184
Wm. Mooney, New York City ... 184
William Gardner, Pittsburgh, Pa ... 184

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd, New York City ... 187
T. F. Rowland, Greenpoint, L. I ... 187
Delly & Fowler, Phila., Pa ... 187
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 186
Stacey Mfg. Co., Cincinnati, Ohio ... 187
Bartlett, Hayward & Co., Baltimore, Md ... 177
Morris, Tasker & Co., Limited, Phila., Pa ... 186
Davis & Farnum M'f'g Co., Waltham, Mass ... 144
R. D. Wood & Co., Phila., Pa ... 186
Southwark Foundry and Machine Co., Philadelphia, Pa ... 186
Bouton Foundry Co., Chicago, Ills ... 183
Smith & Sayre Manufacturing Co., New Yotk City ... 187

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills ... 178

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa ... 184
Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) ... 184
Cincinnati and Newport Iron and Pipe Co., Newport, Ky ... 184
Ohio Pipe Co., Columbus, Ohio ... 184
Pancoast & Rogers, New York City ... 184
M. J. Drummond, New York City ... 184
Wells Rustless Iron Co., New York City ... 176
R. D. Wood & Co., Phila., Pa ... 186

GAS ENGINES.

Schleicher, Schumm & Co. Phila., Pa ... 192
Clerk Gas Engine Co, Phila., Pa ... 179

RETORTS AND FIRE BRICK.

J. H. Gautier & Co., Jersey City, N. J ... 182
B. Kreischer & Sons, New York City ... 182
Adam Weber, New York City ... 182
Laclede Fire Brick Works, St. Louis, Mo ... 182
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y ... 182
Borgner & O'Brien, Phila., Pa ... 182
James Gardner, Jr., Pittsburgh, Pa ... 182
Henry Maurer & Son, New York city ... 182
Chicago Retort and Fire Brick Works, Chicago, Ills ... 182
Baltimore Retort and Fire Brick Co., Baltimore ... 182
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo ... 182
Eveus & Howard, St. Louis, Mo ... 183
Cincinnati Gas Retort and Fire Brick Works, Cincinnati, O. 183
Emil Lenz, New York City ... 183

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City ... 185
R. D. Wood & Co., Phila., Pa ... 186

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 177
Fred. Bredel, New York City ... 183

GAS GOVERNORS.

T. C. Hopper, Phila., Pa ... 180
Connelly & Co., New York City ... 179

CEMENTS.

C. L. Gerould, Manchester, N. H ... 182

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio ... 188

GAS METERS.

Harris, Griffin & Co., Phila., Pa ... 190
American Meter Co., New York and Philadelphia ... 181
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa ... 191
Helme & McIlhenny, Phila., Pa ... 191
D. McDonald & Co. Albany, N. Y ... 191
Nathaniel Tufts, Boston, Mass ... 190

EXHAUSTERS.

P H. & F. M. Roots, Connersville, Ind ... 178
Smith & Sayre Manufacturing Co., New York City ... 187
Wilbraham Bros., Philadelphia, Pa ... 179
Connelly & Co., New York City ... 179

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 189
Perkins & Co., New York City ... 188
Newburgh Orrel Coal Co., Baltimore Md ... 189
Despard Coal Co., Baltimore, Md ... 189
Chesapeake and Ohio R.R. Coal Agency, N. Y. City ... 189
Westmoreland Coal Company, Phila., Pa ... 189
Monongahela & Peters Creek Gas Coal Co., Pittsburgh, Pa. 189

CANNEL COALS.

Perkins & Co., New York City ... 188
J. & W. Wood, New York City ... 188

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 180
John McLean, New York City ... 180
Chapman Valve Manufacturing Co., Boston, Mass ... 180
R. D. Wood & Co., Phila., Pa ... 186
The Combination Gas Machine Co., Detroit, Mich ... 175

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass ... 179

PURIFYING MATERIAL.

S. H. Douglas, Ann Arbor, Mich ... 183
Connelly & Co., New York City ... 179

GAS LAMPS.

The Siemens-Lungren Co., Philadelphia, Pa ... 185
G. Shepard Page, New York City ... 152
Albo-Carbon Light Co., Newark, N. J ... 176
Standard Gas Lamp Co., Phila., Pa ... 183

PURIFIER SCREENS.

John Cabot, New York City ... 183
Geo. A. Mills, Baltimore, Md ... 183

GAS STOVES.

American Meter Co., New York and Philadelphia ... 191
The Goodwin Gas Stove and Meter Co., Phila. Pa ... 160
The Combination Gas Machine Co., Detroit, Mich ... 175

STREET LAMPS.

J. G. Miner, Morrisania, New York City ... 175
Bartlett Street Lamp M'f'g Co., New York City ... 180

BURNERS.

C. A. Gefrorer, Phila., Pa ... 188

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City ... 184

GASHOLDER TANKS.

W. C. Whyte, New York City ... 176

GAS FIXTURES.

Mitchell, Vance & Co., New York City ... 180

COKE CRUSHER.

C. M. Keller, Columbus, Ind ... 189

GAS BAGS.

Peerless Manuf'g Co., New York City ... 179

ELECTRICAL APPARATUS.

Waterhouse Electric & Manufg Co., Hartford, Conn ... 176

BOOKS, ETC.

English Journal of Gas Lighting ... 175
Gas as a Source of Light, Heat and Power ... 180
Goodwin's Directory of Gas Light Companies ... 188
King's Treatise ... 190
Scientific Books ... 190
Management of Small Gas Works ... 184
Newbigging's Gas Manager's Handbook ... 190
Gas vs. Electricity ... 187

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